LOGAN AIRPORT RSA
Runway Safety Area Improvements Project

Boston-Logan International Airport Runway Safety Area Improvements Project, Environmental Notification Form

Boston-Logan International Airport
East Boston, Massachusetts

Prepared for **Massachusetts Port Authority**
East Boston, Massachusetts

Prepared by *Vanasse Hangen Brustlin, Inc.*
Watertown, Massachusetts

in association with **Jacobs/Edwards and Kelcey**

June 30, 2009

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Massachusetts Port Authority
One Harborside Drive, Suite 200S
East Boston, MA 02128-2909
Telephone (617) 428-2800
www.massport.com

June 30, 2009

The Honorable Ian A. Bowles, Secretary
Executive Office of Energy and Environmental Affairs
100 Cambridge Street, Suite 900
Boston, Massachusetts 02114

Re: ***Boston-Logan International Airport Runway Safety Area Improvements Project***

Dear Secretary Bowles:

On behalf of the Massachusetts Port Authority (Massport), I am pleased to submit for your review, the Environmental Notification Form (ENF) for the *Boston-Logan International Airport Runway Safety Area Improvements Project*.

Massport is proposing to enhance the runway safety areas (RSAs) at the ends of Runway 33L and Runway 22R at Boston-Logan International Airport. The proposed improvements are required to enhance the RSAs, to the extent feasible, to be consistent with the current Federal Aviation Administration's airport design criteria for RSAs and to enhance rescue access in the event of an emergency. RSAs are safety improvements and do not extend runways or have any effect on normal runway operations, runway capacity, or types of aircraft that can use the runways. The ENF describes the purpose of, and need for, the proposed RSA enhancements, the alternatives considered, and the potential environmental impacts.

A 30-day public comment period for the ENF will begin on July 8th, 2009, the publication date of the next Environmental Monitor, and will end on August 7, 2009. The attached distribution list indicates that all parties on the distribution list will be sent a copy of the ENF. The ENF will be available for inspection at a number of public libraries (as shown on the ENF distribution list) and on Massport's website (www.massport.com).

Massport hopes that you and other reviewers of the ENF find the document informative. We look forward to your review of this document and to close consultation with you and other reviewers in the coming weeks.

In coordination with your staff, a public consultation session is scheduled with MEPA and the FAA for 3:00 PM on July 30, 2009, at the Logan Office Center, One Harborside Drive, East Boston (Logan Airport) in the Board Room to receive comments on the project and for MEPA and FAA's use in determining the scope for a combined federal and state Draft Environmental Assessment/Environmental Impact Report (Draft EA/EIR).

Please feel free to contact me at (617) 568-3524 if you have any questions.

Very truly yours,

Stewart Dalzell
Deputy Director, Economic Planning and Development

Cc: R. Doucette/FAA

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Environmental Notification Form (ENF) and Figures

Attachment A: ENF Narrative Report and Figures

Attachment B: ENF Distribution List

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Commonwealth of Massachusetts
Executive Office of Environmental Affairs ■ MEPA Office

ENF Environmental Notification Form

For Office Use Only *Executive Office of Environmental Affairs*
EOEA No.: _____ .
MEPA Analyst: _____ .
Phone: 617-626-_____

The information requested on this form must be completed to begin MEPA Review in accordance with the provisions of the Massachusetts Environmental Policy Act, 301 CMR 11.00.

Project Name: **Boston-Logan International Airport Runway Safety Area Improvements Project**		
Street: **Harborside Drive**		
Municipality: **East Boston**	Watershed: **Boston Harbor**	
Universal Tranverse Mercator Coordinates: **UTM 19, 46 93 783N, 3 34 992E**	Latitude: **42º 22' 44" N** Longitude:**71º 00' 16" W (for Runway 33L)**	
Estimated commencement date: **2010**	Estimated completion date: **2011**	
Approximate cost: **$60 million (Includes both Runway 33L and Runway 22R ends)**	Status of project design: **10%**	
Proponent: **The Massachusetts Port Authority (Massport)**		
Street: **One Harborside Drive, Suite 200S**		
Municipality: **East Boston**	State: **MA**	Zip Code: **02128-2909**
Name of Contact Person From Whom Copies of this ENF May Be Obtained: **Stewart Dalzell**		
Firm/Agency: **Massachusetts Port Authority**	Street: **One Harborside Drive, Suite 200S**	
Municipality: **East Boston**	State: **MA**	Zip Code: **02128-2909**
Phone: **(617) 568-3524**	Fax: **(617) 568-3518**	E-mail: **SDalzell@massport.com**

Does this project meet or exceed a mandatory EIR threshold (see 301 CMR 11.03)?
☒Yes ☐No

Has this project been filed with MEPA before?
☒ Yes (EOEA No. 5122) - For the Runway 33L end ☐No

Has any project on this site been filed with MEPA before?
☒ Yes (EOEA No. 5122) ☐No

Is this an Expanded ENF (see 301 CMR 11.05(7)) requesting:
a Single EIR? (see 301 CMR 11.06(8)) ☐Yes ☒No
a Special Review Procedure? (see 301CMR 11.09) ☐Yes ☒No
a Waiver of mandatory EIR? (see 301 CMR 11.11) ☐Yes ☒No
a Phase I Waiver? (see 301 CMR 11.11) ☐Yes ☒No

Identify any financial assistance or land transfer from an agency of the Commonwealth, including the agency name and the amount of funding or land area (in acres): **This is a project funded by, and on land owned by, an agency of the Commonwealth. Additional funding will be sought from FAA.**

Are you requesting coordinated review with any other federal, state, regional, or local agency?
☒Yes — **Proponent will prepare a joint EA/EIR for review by FAA and EOEEA.**
☐No

List Local or Federal Permits and Approvals: **NPDES General Permit for Stormwater Discharge from Construction Activities and Stormwater Notice of Intent (U.S. Environmental Protection Agency); Finding of No Significant Impact (FAA); Section 10 and Section 404 Permit (US Army Corps of Engineers); Section 401 Water Quality Certification, Wetlands Variance, and Chapter 91 License (Massachusetts Department of Environmental Protection); Consistency Determination (Massachusetts Office of Coastal Zone Management); FAA Airport Layout Plan Approval.**

Which ENF or EIR review threshold(s) does the project meet or exceed (see 301 CMR 11.03):

☐ Land	☐ Rare Species	☒ Wetlands, Waterways, & Tidelands
☐ Water	☐ Wastewater	☐ Transportation
☐ Energy	☐ Air	☐ Solid & Hazardous Waste
☐ ACEC	☐ Regulations	☐ Historical & Archaeological Resources

Summary of Project Size & Environmental Impacts	Existing	Change	Total	State Permits & Approvals
LAND				☒ Order of Conditions
Total site acreage	~2,400 acres, incl. 700 acres of Boston Harbor (entire airport)			☐ Superseding Order of Conditions
New acres of land altered		10.6 acres		☒ Chapter 91 License
Acres of impervious area	1.5 acres	3.4 acres	4.9 acres	☒ 401 Water Quality Certification
Square feet of new bordering vegetated wetlands alteration		0		☐ MHD or MDC Access Permit
Square feet of new other wetland alteration		215,320 sq. ft. (Total for both Runway 33L and Runway 22R ends)		☐ Water Management Act Permit
Acres of new non-water dependent use of tidelands or waterways		4.9 acres (Total for both Runway 33L and Runway 22R ends)		☐ New Source Approval
STRUCTURES				☐ DEP or MWRA Sewer Connection/ Extension Permit
Gross square footage	0	0	0	☒ Other Permits (*including Legislative Approvals*) – Specify:
Number of housing units	0	0	0	**MA Coastal Zone Management - Federal Consistency Determination**
Maximum height (in feet)	0	0	0	**Section 10 and Section 404 Permit from US Army Corps of Engineers**
TRANSPORTATION				**Wetlands Variance**
Vehicle trips per day: Site	0	0	0	**FAA Airport Layout Plan Approval**
Vehicle trips per day: Airport-wide	0	0	0	
Parking spaces: Site	0	0	0	
Parking spaces: Airport-wide	0	0	0	
WASTEWATER				
Gallons/day (GPD) of water use	0	0	0	
GPD water withdrawal	0	0	0	
GPD wastewater generation/ treatment	0	0	0	
Length of water/sewer mains (in miles)	0	0	0	

CONSERVATION LAND: Will the project involve the conversion of public parkland or other Article 97 public natural resources to any purpose not in accordance with Article 97?

☐Yes (Specify_____) ☒No

Will it involve the release of any conservation restriction, preservation restriction, agricultural preservation restriction, or watershed preservation restriction?

☐Yes (Specify_____) ☒No

RARE SPECIES: Does the project site include Estimated Habitat of Rare Species, Vernal Pools, Priority Sites of Rare Species, or Exemplary Natural Communities?

☒Yes **— Proposed runway safety area enhancements for Runway 33L and 22R are within NHESP mapped priority habitats for rare species but will not affect grassland areas.**

☐No

HISTORICAL /ARCHAEOLOGICAL RESOURCES: Does the project site include any structure, site or district listed in the State Register of Historic Place or the inventory of Historic and Archaeological Assets of the Commonwealth?

☐Yes (Specify_____) ☒No

If yes, does the project involve any demolition or destruction of any listed or inventoried historic or archaeological resources?

☐Yes (Specify_____) ☐No

AREAS OF CRITICAL ENVIRONMENTAL CONCERN: Is the project in or adjacent to an Area of Critical Environmental Concern?

☐Yes (Specify_____) ☒No

PROJECT DESCRIPTION: The project description should include **(a)** a description of the project site, **(b)** a description of both on-site and off-site alternatives and the impacts associated with each alternative, and **(c)** potential on-site and off-site mitigation measures for each alternative (*You may attach one additional page, if necessary*.)

Description of Site and Program

The Massachusetts Port Authority (Massport) is proposing to enhance the runway safety areas (RSAs) at the ends of Runway 33L and Runway 22R at Boston-Logan International Airport (Logan Airport). The proposed improvements are required to enhance the RSAs, to the extent feasible, to be consistent with the Federal Aviation Administration's (FAA's) current airport design criteria for RSAs and to enhance rescue access in the event of an emergency. Typical RSAs are 1,000 feet long by 500 feet wide. RSAs are safety improvements and do not extend runways or have any effect on normal runway operations, runway capacity or types of aircraft which can use the runways.

The existing RSA at the end of Runway 33L does not meet standard FAA design criteria for overrun and undershoot protection for the design aircraft for that runway, the Boeing 747-400. The existing RSA is 187.5 feet long and 500 feet wide. Within this area is a 158-foot long and 170-foot wide Engineered Material Arresting System (EMAS) bed, installed in 2006 as an interim safety measure. An EMAS bed is constructed of collapsible concrete blocks with predictable deceleration forces. When an aircraft rolls into an EMAS bed, the tires of the aircraft collapse the lightweight concrete, and the aircraft is slowed down in a way that minimizes damage to the aircraft. The existing EMAS bed is capable of arresting a Boeing 757-200 exiting the runway at a speed of 38 knots or less or a Boeing 737-800 at 42 knots or less, but provides minimal arrestment for the design aircraft, the Boeing 747-400. The existing Runway 33L RSA is also too short to provide undershoot protection consistent with the FAA criteria. The proposed project is intended to enhance the Runway 33L RSA so that it provides overrun and undershoot protection consistent with the design criteria in the FAA's Airport Design Advisory Circular (Advisory Circular 150/5300-13, Airport Design, March 28, 2007) to the extent feasible.

The existing RSA at the end of Runway 22R meets the minimum FAA design criteria for overrun protection for the runway's design aircraft but does not comply with undershoot requirements. However, given that Runway 22R is very rarely used for arrivals and has an 815-foot displaced threshold, it is unlikely that aircraft would ever undershoot this end of the runway. Therefore, the Runway 22R RSA enhancement is intended to protect aircraft in the event that an aircraft arriving on Runway 4L overruns and fails to stop on the runway. The RSA is 215 feet long and 500 feet wide, and includes a 190-foot long and 170-foot wide EMAS bed. The EMAS bed provides the minimum arrestment speed acceptable by the FAA (40 knots) for the design aircraft, the Boeing 757-200. The Runway 22R EMAS bed also provides arrestment at higher speeds for many of the smaller aircraft frequently using this runway. The arresting performance improves with lighter aircraft (e.g. EMAS bed will arrest a Boeing 737-800 that leaves the runway at 51 to 57 knots or less and a CRJ-200 that leaves the runway at 60 to 66 knots or less). As a condition of approving the installation of the existing EMAS bed, the FAA required Massport to consider options for further enhancing the level of safety provided by the existing RSA. This request is consistent with that commitment.

Description of Alternatives

An extensive screening process was conducted and a wide range of alternatives have been considered and analyzed for this project. Chapter 3, *Alternatives Considered*, provides complete descriptions of the alternatives. The following alternatives were considered:

Runway 33L

- **FAA Full 1,000-Foot RSA**
- **Shorten and/or shift runway and enhance RSA with EMAS**
- **RSA with EMAS, including width and platform options**
- **No-Action**

An inclined safety area alternative was not considered for Runway 33L because it cannot provide protection for aircraft in the event of an undershoot. Furthermore, the inclined safety area previously permitted (EOEA #5122) was not constructed due to concerns by pilots related to the transition between the proposed inclined safety area and the existing light pier. The FAA design criteria require that the alternatives for Runway 33L provide protection for both aircraft overruns and undershoots.

Runway 22R

- **Enhanced EMAS**
- **Inclined Safety Area**
- **No Action**

After eliminating several alternatives due to cost or unacceptable environmental impacts, the alternatives being carried forward to the Draft EA/EIR are the 600-foot long by 300-foot wide RSA with EMAS on a pile-supported deck and the no action alternative for Runway 33L, and the inclined safety area and no action alternative for Runway 22R.

Any of the Build Alternatives for either runway would increase impervious surface and alter wetland resources, as summarized in the Wetlands, Waterways, and Tidelands Section of this form and in Chapter 4, *Description of Environmental Resources, Impacts, and Permits Required*. Placing fill for the Build Alternatives could affect wave direction/velocity and sediment erosion/deposition and thus the recommended action for Runway 33L involves construction of a pile-supported deck to support the proposed EMAS enhancement. None of the alternatives would be expected to degrade water quality. There would be no increase in aircraft operations, runway use, or vehicular traffic, and no historic or archaeological resources would be impacted.

Description of Mitigation Measures and Environmental Benefits

The attached narrative provides details on project-related impacts and proposed mitigation measures. Mitigation measures will be identified in the Draft EA/EIR for both runway ends for each of the Build Alternatives considered.

- **Loss of Salt Marsh would be required at the Runway 22R end. Measures to minimize or avoid impacts will be identified, and measures to compensate for Salt Marsh loss will be developed in consultation with the Boston Conservation Commission, Massachusetts Department of**

Environmental Protection, and the US Army Corps of Engineers. Compensatory wetland mitigation measures may include the restoration of previously filled or degraded Salt Marsh as well as the construction of new Salt Marsh areas.

- **Impacts to shellfish beds may result from any alternative with in-water construction. To the extent any impacts result, potential mitigation measures and areas will be identified in the Draft EA/EIR, in consultation with the National Marine Fisheries Service, Division of Marine Fisheries, and the City of Boston.**
- **Impacts to submerged aquatic vegetation (eelgrass) would occur at the Runway 33L end. The potential impacts to eelgrass will be assessed, and mitigation strategies identified during preparation of the Draft EA/EIR. A federal and state interagency eelgrass working group has been established to address this issue. The first working group meeting was held in April 2009.**
- **The Draft EA/EIR will describe proposed mitigation measures to protect water quality during the construction period and, if required, post-construction. Massport anticipates that the existing stormwater collection and treatment system at Logan Airport is expected to be adequate to protect receiving water quality in compliance with the Airport's National Pollutant Discharge Elimination System (NPDES) permit.**

LAND SECTION – all proponents must fill out this section

I. Thresholds / Permits

A. Does the project meet or exceed any review thresholds related to **land** (see 301 CMR 11.03(1) ___ Yes _**X**_ No; if yes, specify each threshold:

II. Impacts and Permits

A. Describe, in acres,* the current and proposed character of the project site, as follows:

	Existing	Change	Total
Footprint of buildings	0	0	0
Roadways, parking, and other paved areas	1.5	+3.4	4.9
Other altered areas (pervious cover/fill)	1.3	+2.1	3.4
Undeveloped areas (coastal wetlands)	9.8	-5.1	4.7

B. Has any part of the project site been in active agricultural use in the last three years? ___ Yes _**X**_ No; if yes, how many acres of land in agricultural use (with agricultural soils) will be converted to nonagricultural use?

C. Is any part of the project site currently or proposed to be in active forestry use? ___ Yes _**X**_ No; if yes, please describe current and proposed forestry activities and indicate whether any part of the site is the subject of a DEM-approved forest management plan:

D. Does any part of the project involve conversion of land held for natural resources purposes in accordance with Article 97 of the Amendments to the Constitution of the Commonwealth to any purpose not in accordance with Article 97? ___ Yes _**X**_ No; if yes, describe:

E. Is any part of the project site currently subject to a conservation restriction, preservation restriction, agricultural preservation restriction or watershed preservation restriction?__ Yes _**X**_ No; if yes, does the project involve the release or modification of such restriction? ___ Yes ___ No; if yes, describe:

F. Does the project require approval of a new urban redevelopment project or a fundamental change in an existing urban redevelopment project under M.G.L.c.121A? ___ Yes _**X**_ No; if yes, describe:

G. Does the project require approval of a new urban renewal plan or a major modification of an existing urban renewal plan under M.G.L.c.121B? Yes ___ No _**X**_ ; if yes, describe:

H. Describe the project's stormwater impacts and, if applicable, measures that the project will take to comply with the standards found in DEP's Stormwater Management Policy:

The project would comply with applicable Stormwater Policy Standards. The proposed safety area improvements and relocated perimeter road could result in a minor increase in the amount of impervious surfaces in the vicinity of the Runway 33L and Runway 22R ends, which could result in a minor increase in the rate of runoff to Boston Harbor. The project would not increase vehicular traffic on the perimeter road, would not increase existing operations, and would not increase the risk of spills or other contamination. Therefore, the project does not involve any land uses with higher potential pollutant loads and would not affect pollutant loading from Logan Airport.

I. Is the project site currently being regulated under M.G.L.c.21E or the Massachusetts Contingency Plan? Yes ___ No _**X**_ ; if yes, what is the Release Tracking Number (RTN)?

J. If the project is site is within the Chicopee or Nashua watershed, is it within the Quabbin, Ware, or Wachusett subwatershed? ___ Yes _**X**_ No; if yes, is the project site subject to regulation under the Watershed Protection Act? ___ Yes ___ No

K. Describe the project's other impacts on land:

The proposed RSA enhancements are not expected to have any additional impacts on land than those described above. The project will enhance existing RSAs and will not change the overall land use.

III.. Consistency

A. Identify the current municipal comprehensive land use plan and the open space plan and describe the consistency of the project and its impacts with that plan(s):

Regional and local land use plans recognize continual use of Logan Airport for airport purposes. The proposed RSA enhancements are consistent with such use.

B. Identify the current Regional Policy Plan of the applicable Regional Planning Agency and describe the consistency of the project and its impacts with that plan:

Regional and local land use plans recognize continual use of Logan Airport for airport purposes. The proposed RSA enhancements are consistent with such use and will enhance safety for all users.

C. Will the project require any approvals under the local zoning by-law or ordinance (i.e. text or map amendment, special permit, or variance)? Yes ___ No _**X**_ ; if yes, describe:

D. Will the project require local site plan or project impact review?
___ Yes _**X**_ No; if yes, describe:

RARE SPECIES SECTION

I. Thresholds / Permits

A. Will the project meet or exceed any review thresholds related to **rare species or habitat** (see 301 CMR 11.03(2))? __ Yes _**X**_ No; if yes, specify, in quantitative terms:

Review of the Massachusetts Natural Heritage Atlas indicates there is mapped priority habitat in the Runway 33L RSA study area. However, the Runway 33L enhancements will not adversely affect upland habitat or associated rare species. Review of the NHESP Atlas indicates there is no priority habitat in the Runway 22R RSA study area.

B. Does the project require any state permits related to **rare species or habitat**? _ __ Yes _ __ No

TO BE DETERMINED — Review of the Massachusetts Natural Heritage Atlas indicates there is priority habitat in the Runway 33L RSA study area but not in the Runway 22R RSA study area. A data request has been sent to the Massachusetts Natural Heritage and Endangered Species Program (NHESP) to confirm whether or not protected species are known to occur in the study area.

C. If you answered "No" to both questions A and B, proceed to the **Wetlands, Waterways, and Tidelands Section**. If you answered "Yes" to either question A or question B, fill out the remainder of the Rare Species section below.

II. Impacts and Permits

A. Does the project site fall within Priority or Estimated Habitat in the current Massachusetts Natural Heritage Atlas (attach relevant page)? _**X**_ Yes ___ No. If yes,

1. Which rare species are known to occur within the Priority or Estimated Habitat (contact: Environmental Review, Natural Heritage and Endangered Species Program, Route 135, Westborough, MA 01581, allowing 30 days for receipt of information):

   Upland sandpiper (*Bartramia longicauda*) is known to occur in the grassy uplands of the airfield.

2. Have you surveyed the site for rare species? ___ Yes _**X**_ No; if yes, please include the results of your survey.
3. If your project is within Estimated Habitat, have you filed a Notice of Intent or received an Order of Conditions for this project? ___ Yes _**X**_ No; if yes, did you send a copy of the Notice of Intent to the Natural Heritage and Endangered Species Program, in accordance with the Wetlands Protection Act regulations? ___ Yes ___ No

B. Will the project "take" an endangered, threatened, and/or species of special concern in accordance with M.G.L. c.131A (see also 321 CMR 10.04)? ___ Yes _**X**_ No; if yes, describe:

C. Will the project alter "significant habitat" as designated by the Massachusetts Division of Fisheries and Wildlife in accordance with M.G.L. c.131A (see also 321 CMR 10.30)? ___ Yes _**X**_ No; if yes, describe:

D. Describe the project's other impacts on rare species including indirect impacts (for example, stormwater runoff into a wetland known to contain rare species or lighting impacts on rare moth habitat):

WETLANDS, WATERWAYS, AND TIDELANDS SECTION

I. Thresholds / Permits

A. Will the project meet or exceed any review thresholds related to **wetlands, waterways, and tidelands** (see 301 CMR 11.03(3))? _**X**_ Yes ___ No; if yes, specify, in quantitative terms:

The project would exceed review thresholds related to wetlands, waterways, and tidelands. The RSA enhancement for Runway 22R exceeds the review threshold for the alteration of Salt Marsh and Coastal Bank. The RSA enhancement for Runway 33L exceeds the review threshold for Coastal Bank.

B. Does the project require any state permits (or a local Order of Conditions) related to **wetlands, waterways, or tidelands**? _**X**_ Yes ___ No; if yes, specify which permit:

Both projects would require an Order of Conditions from the Boston Conservation Commission. Work on Runway 22R would require a Variance due to loss of Salt Marsh and work on Runway 33L would require a Variance due to loss of Submerged Aquatic Vegetation (eelgrass).

C. If you answered "No" to both questions A and B, proceed to the **Water Supply Section**. If you answered "Yes" to either question A or question B, fill out the remainder of the Wetlands, Waterways, and Tidelands Section below.

II. Wetlands Impacts and Permits

A. Describe any wetland resource areas currently existing on the project site and indicate them on the site plan: **See Chapter 4*, Description of Environmental Resources and Permits Required*.**

B. Estimate the extent and type of impact that the project will have on wetland resources, and indicate whether the impacts are temporary or permanent:

Coastal Wetlands	**Area (in sq. ft.) or Length (in linear ft.)**	
	Runway 33L	**Runway 22R**
Land Under the Ocean	95,530 sq. ft.	4,700 sq. ft.
Designated Port Areas	0	0
Coastal Beaches	27,550 sq. ft.	35,360 sq. ft.
Coastal Dunes	0	0
Barrier Beaches	0	0
Coastal Banks	315 linear ft.	530 linear ft.
Rocky Intertidal Shores	0	0
Salt Marshes	0	27,930 sq. ft.
Land Under Salt Ponds	0	0
Land Containing Shellfish	123,080 sq. ft.	67,990 sq. ft.
Fish Runs	0	0
Land Subject to Coastal Storm Flowage	129,930 sq. ft.	82,790 sq. ft.

All impacts are permanent.

Inland Wetlands	**Area (in sq. ft.) or Length (in linear ft.)**	
	Runway 33L	**Runway 22R**
Bank	0	0
Bordering Vegetated Wetlands	0	0
Land Under Water	0	0
Isolated Land Subject to Flooding	0	0
Bordering Land Subject to Flooding	0	0
Riverfront Area	0	0

C. Is any part of the project

1. a limited project? ___ Yes _**X**_ No
2. the construction or alteration of a dam? ___ Yes _**X**_ No; if yes, describe:
3. fill or structure in a velocity zone or regulatory floodway? ___ Yes _**X**_ No
4. dredging or disposal of dredged material? _**X**_ Yes ___ No; if yes, describe the volume of dredged material and the proposed disposal site:
   The project will require dredging to remove structurally unsuitable substrate within Boston Harbor at the end of Runway 22R. The volume to be dredged will be investigated during the preparation of the Draft EA/EIR.

5. a discharge to Outstanding Resource Waters? ___ Yes _**X**_ No
6. subject to a wetlands restriction order? ___ Yes _**X**_ No; if yes, identify the area (in square feet):

D. Does the project require a new or amended Order of Conditions under the Wetlands Protection Act (M.G.L. c.131A)? _**X**_ Yes ___ No; if yes, has a Notice of Intent been filed or a local Order of Conditions issued? ___ Yes _**X**_ No; if yes, list the date and DEP file number:_____. Was the Order of Conditions appealed? ___ Yes ___ No. Will the project require a variance from the Wetlands regulations? _**X**_ Yes ___ No. **Runway 33L and 22R, anticipated.**

E. Will the project:

1. be subject to a local wetlands ordinance or bylaw? ___ Yes _**X**_ No
2. alter any federally-protected wetlands not regulated under state or local law?
   ___ Yes _**X**_ No; if yes, what is the area (in s.f.)?

F. Describe the project's other impacts on wetlands (including new shading of wetland areas or removal of tree canopy from forested wetlands): **None.**

III. Waterways and Tidelands Impacts and Permits

A. Is any part of the project site waterways or tidelands (including filled former tidelands) that are subject to the Waterways Act, M.G.L.c.91? _**X**_ Yes ___ No; if yes, is there a current Chapter 91 license or permit affecting the project site? ___ Yes _**X**_ No; if yes, list the date and number:

B. Does the project require a new or modified license under M.G.L.c.91? _**X**_ Yes ___ No; if yes, how many acres of the project site subject to M.G.L.c.91 will be for non-water dependent use?
   None of the sites will involve water-dependent use.

C. Is any part of the project

1. a roadway, bridge, or utility line to or on a barrier beach? ___ Yes __**X**__ No; if yes, describe:
2. dredging or disposal of dredged material? _**X**_ Yes ___ No; if yes, volume of dredged material
   The project will require dredging to remove structurally unsuitable substrate within Boston Harbor at the end of Runway 22R. The volume to be dredged will be investigated during the preparation of the Draft EA/EIR.

3. a solid fill, pile-supported, or bottom-anchored structure in flowed tidelands or other waterways? _**X**_ Yes ___ No; if yes, what is the base area?
   2.3 acres (maximum combined area of fill/pile-supported structure including both runway ends).

4. within a Designated Port Area? _**X**_ Yes ___ No

D. Describe the project's other impacts on waterways and tidelands:
The proposed RSA enhancements will not have any impact on recreational or commercial boating within Boston Harbor. There is no public access within the project area due to Logan Airport's legislated security zone.

IV. Consistency:

A. Is the project located within the Coastal Zone? _**X**_ Yes ___ No; if yes, describe the project's consistency with policies of the Office of Coastal Zone Management:
See Chapter 4*, Description of Environmental Resources, Impacts, and Permits Required*.

B. Is the project located within an area subject to a Municipal Harbor Plan? ___ Yes _**X**_ No; if yes, identify the Municipal Harbor Plan and describe the project's consistency with that plan:

WATER SUPPLY SECTION

I. Thresholds / Permits

A. Will the project meet or exceed any review thresholds related to **water supply** (see 301 CMR 11.03(4))? ___ Yes _**X**_ No; if yes, specify, in quantitative terms:

B. Does the project require any state permits related to **water supply**? ___ Yes _**X**_ No; if yes, specify which permit:

C. If you answered "No" to both questions A and B, proceed to the **Wastewater Section**. If you answered "Yes" to either question A or question B, fill out the remainder of the Water Supply Section below.

II. Impacts and Permits

A. Describe, in gallons/day, the volume and source of water use for existing and proposed activities at the project site:

	Existing	Change	Total
Withdrawal from groundwater	_____	_____	_____
Withdrawal from surface water	_____	_____	_____
Interbasin transfer	_____	_____	_____
Municipal or regional water supply	_____	_____	_____

B. If the source is a municipal or regional supply, has the municipality or region indicated that there is adequate capacity in the system to accommodate the project? ___ Yes ___ No

C. If the project involves a new or expanded withdrawal from a groundwater or surface water source,

1. have you submitted a permit application? ___ Yes ___ No; if yes, attach the application
2. have you conducted a pump test? ___ Yes ___ No; if yes, attach the pump test report

D. What is the currently permitted withdrawal at the proposed water supply source (in gallons/day)? _____Will the project require an increase in that withdrawal?___ Yes ___ No

E. Does the project site currently contain a water supply well, a drinking water treatment facility, water main, or other water supply facility, or will the project involve construction of a new facility? ___ Yes ___ No. If yes, describe existing and proposed water supply facilities at the project site:

	Existing	Change	Total
Water supply well(s) (capacity, in gpd)	_____	_____	_____
Drinking water treatment plant (capacity, in gpd)	_____	_____	_____
Water mains (length, in miles)	_____	_____	_____

F. If the project involves any interbasin transfer of water, which basins are involved, what is the direction of the transfer, and is the interbasin transfer existing or proposed?

G. Does the project involve

1. new water service by a state agency to a municipality or water district? ___ Yes ___ No
2. a Watershed Protection Act variance? ___ Yes ___ No
   if yes, how many acres of alteration?
3. a non-bridged stream crossing 1,000 or less feet upstream of a public surface drinking water supply for purpose of forest harvesting activities? ___ Yes ___ No

H. Describe the project's other impacts (including indirect impacts) on water resources, quality, facilities and services:

III. Consistency -- Describe the project's consistency with water conservation plans or other plans to enhance water resources, quality, facilities and services:

WASTEWATER SECTION

I. Thresholds / Permits

A. Will the project meet or exceed any review thresholds related to **wastewater** (see 301 CMR 11.03(5))? __ Yes _**X**_ No; if yes, specify, in quantitative terms:

B. Does the project require any state permits related to **wastewater**? ___ Yes _**X**_ No; if yes, specify which permit:

C. If you answered "No" to both questions A and B, proceed to the **Transportation -- Traffic Generation Section**. If you answered "Yes" to either question A or question B, fill out the remainder of the Wastewater Section below.

II. Impacts and Permits

A. Describe, in gallons/day, the volume and disposal of wastewater generation for existing and proposed activities at the project site (calculate according to 310 CMR 15.00):

	Existing	Change	Total
Discharge to groundwater (Title 5)	_____	_____	_____
Discharge to groundwater (non-Title 5)	_____	_____	_____
Discharge to outstanding resource water	_____	_____	_____
Discharge to surface water	_____	_____	_____
Municipal or regional wastewater facility	_____	_____	_____
TOTAL	_____	_____	_____

B. Is there sufficient capacity in the existing collection system to accommodate the project? ___Yes ___ No; if no, describe where capacity will be found:

C. Is there sufficient existing capacity at the proposed wastewater disposal facility? ___ Yes ___ No; if no, describe how capacity will be increased:

D. Does the project site currently contain a wastewater treatment facility, sewer main, or other wastewater disposal facility, or will the project involve construction of a new facility? ___ Yes ___ No. If yes, describe as follows:

	Existing	Change	Total
Wastewater treatment plant (capacity, in gpd)	_____	_____	_____
Sewer mains (length, in miles)	_____	_____	_____
Title 5 systems (capacity, in gpd)	_____	_____	_____

E. If the project involves any interbasin transfer of wastewater, which basins are involved, what is the direction of the transfer, and is the interbasin transfer existing or proposed? Not applicable.

F. Does the project involve new sewer service by an Agency of the Commonwealth to a municipality or sewer district? ___ Yes ___ No

G. Is there any current or proposed facility at the project site for the storage, treatment, processing, combustion or disposal of sewage sludge, sludge ash, grit, screenings, or other sewage residual materials? ___ Yes ___No; if yes, what is the capacity (in tons per day):

	Existing	Change	Total
Storage	_____	_____	_____
Treatment, processing	_____	_____	_____
Combustion	_____	_____	_____
Disposal	_____	_____	_____

H. Describe the project's other impacts (including indirect impacts) on wastewater generation and treatment facilities:

III. Consistency -- Describe measures that the proponent will take to comply with federal, state, regional, and local plans and policies related to wastewater management:

A. If the project requires a sewer extension permit, is that extension included in a comprehensive wastewater management plan? ___ Yes ___ No; if yes, indicate the EOEA number for the plan and describe the relationship of the project to the plan

TRANSPORTATION -- TRAFFIC GENERATION SECTION

I. Thresholds / Permits

A. Will the project meet or exceed any review thresholds related to **traffic generation** (see 301 CMR 11.03(6))? ___ Yes _**X**_ No; if yes, specify, in quantitative terms:

B. Does the project require any state permits related to **state-controlled roadways**? ___ Yes _**X**_ No; if yes, specify which permit:

C. If you answered "No" to both questions A and B, proceed to the **Roadways and Other Transportation Facilities Section**. If you answered "Yes" to either question A or question B, fill out the remainder of the Traffic Generation Section below.

II. Traffic Impacts and Permits

A. Describe existing and proposed vehicular traffic generated by activities at the project site:

	Existing	Change	Total
Number of parking spaces: Site	_____	_____	_____
Number of parking spaces: Airport-wide	_____	_____	_____
Number of vehicle trips per day: Site	_____	_____	_____
Number of vehicle trips per day: Airport-wide	_____	_____	_____
ITE Land Use Code(s):	_____		

B. What is the estimated average daily traffic on roadways serving the site?

	Roadway	Existing	Change	Total
1.	_____	_____	_____	_____

C. Describe how the project will affect transit, pedestrian and bicycle transportation facilities and services:

III. Consistency -- Describe measures that the proponent will take to comply with municipal, regional, state, and federal plans and policies related to traffic, transit, pedestrian and bicycle transportation facilities and services:

ROADWAYS AND OTHER TRANSPORTATION FACILITIES SECTION

I. Thresholds

A. Will the project meet or exceed any review thresholds related to **roadways or other transportation facilities** (see 301 CMR 11.03(6))? ___ Yes _**X**_ No; if yes, specify, in quantitative terms:

B. Does the project require any state permits related to **roadways or other transportation facilities**? ___ Yes _**X**_ No; if yes, specify which permit:

C. If you answered "No" to both questions A and B, proceed to the **Energy Section**. If you answered "Yes" to either question A or question B, fill out the remainder of the Roadways Section below.

II. Transportation Facility Impacts

A. Describe existing and proposed transportation facilities at the project site:

	Existing	Change	Total
Length (in linear feet) of new or widened roadway	_____	_____	_____
Width (in feet) of new or widened roadway	_____	_____	_____

Other transportation facilities:

B. Will the project involve any

1. Alteration of bank or terrain (in linear feet)? _____
2. Cutting of living public shade trees (number)? _____
3. Elimination of stone wall (in linear feet)? _____

III. Consistency -- Describe the project's consistency with other federal, state, regional, and local plans and policies related to traffic, transit, pedestrian and bicycle transportation facilities and services, including consistency with the applicable regional transportation plan and the Transportation Improvements Plan (TIP), the State Bicycle Plan, and the State Pedestrian Plan:

ENERGY SECTION

I. Thresholds / Permits

A. Will the project meet or exceed any review thresholds related to **energy** (see 301 CMR 11.03(7))? ___ Yes _**X**_ No; if yes, specify, in quantitative terms:

B. Does the project require any state permits related to **energy**? ___ Yes _**X**_ No; if yes, specify which permit:

C. If you answered "No" to both questions A and B, proceed to the **Air Quality Section**. If you answered "Yes" to either question A or question B, fill out the remainder of the Energy Section below.

II. Impacts and Permits

A. Describe existing and proposed energy generation and transmission facilities at the project site:

	Existing	Change	Total
Capacity of electric generating facility (megawatts)	_____	_____	_____
Length of fuel line (in miles)	_____	_____	_____
Length of transmission lines (in miles)	_____	_____	_____
Capacity of transmission lines (in kilovolts)	_____	_____	_____

B. If the project involves construction or expansion of an electric generating facility, what are
1. the facility's current and proposed fuel source(s)?
2. the facility's current and proposed cooling source(s)?

C. If the project involves construction of an electrical transmission line, will it be located on a new, unused, or abandoned right of way?___ Yes ___ No; if yes, please describe:

D. Describe the project's other impacts on energy facilities and services:

III. Consistency -- Describe the project's consistency with state, municipal, regional, and federal plans and policies for enhancing energy facilities and services:

AIR QUALITY SECTION

I. Thresholds

A. Will the project meet or exceed any review thresholds related to **air quality** (see 301 CMR 11.03(8))? ___ Yes _**X**_ No; if yes, specify, in quantitative terms:

B. Does the project require any state permits related to **air quality**? ___ Yes _**X**_ No; if yes, specify which permit:

C. If you answered "No" to both questions A and B, proceed to the **Solid and Hazardous Waste Section**. If you answered "Yes" to either question A or question B, fill out the remainder of the Air Quality Section below.

II. Impacts and Permits

A. Does the project involve construction or modification of a major stationary source (see 310 CMR 7.00, Appendix A)?___ Yes ___ No; if yes, describe existing and proposed emissions (in tons per day) of:

	Existing	Change	Total
Particulate matter	_____	_____	_____
Carbon monoxide	_____	_____	_____
Sulfur dioxide	_____	_____	_____
Volatile organic compounds	_____	_____	_____
Oxides of nitrogen	_____	_____	_____
Lead	_____	_____	_____
Any hazardous air pollutant	_____	_____	_____
Carbon dioxide	_____	_____	_____

B. Describe the project's other impacts on air resources and air quality, including noise impacts:

III. Consistency

A. Describe the project's consistency with the State Implementation Plan:

B. Describe measures that the proponent will take to comply with other federal, state, regional, and local plans and policies related to air resources and air quality:

SOLID AND HAZARDOUS WASTE SECTION

I. Thresholds / Permits

A. Will the project meet or exceed any review thresholds related to **solid or hazardous waste** (see 301 CMR 11.03(9))? ___ Yes _**X**_ No; if yes, specify, in quantitative terms:

B. Does the project require any state permits related to **solid and hazardous waste**? ___ Yes _**X**_ No; if yes, specify which permit:

C. If you answered "No" to both questions A and B, proceed to the **Historical and Archaeological Resources Section**. If you answered "Yes" to either question A or question B, fill out the remainder of the Solid and Hazardous Waste Section below.

II. Impacts and Permits

A. Is there any current or proposed facility at the project site for the storage, treatment, processing, combustion or disposal of solid waste? ___ Yes ___ No; if yes, what is the volume (in tons per day) of the capacity:

	Existing	Change	Total
Storage	_____	_____	_____
Treatment, processing	_____	_____	_____
Combustion	_____	_____	_____
Disposal	_____	_____	_____

B. Is there any current or proposed facility at the project site for the storage, recycling, treatment or disposal of hazardous waste? ___ Yes ___ No; if yes, what is the volume (in tons or gallons per day) of the capacity:

	Existing	Change	Total
Storage	_____	_____	_____
Recycling	_____	_____	_____
Treatment	_____	_____	_____
Disposal	_____	_____	_____

C. If the project will generate solid waste (for example, during demolition or construction), describe alternatives considered for re-use, recycling, and disposal:

D. If the project involves demolition, do any buildings to be demolished contain asbestos?

___ Yes ___ No

E. Describe the project's other solid and hazardous waste impacts (including indirect impacts):

III. Consistency--Describe measures that the proponent will take to comply with the State Solid Waste Master Plan:

HISTORICAL AND ARCHAEOLOGICAL RESOURCES SECTION

I. Thresholds / Impacts

A. Is any part of the project site a historic structure, or a structure within a historic district, in either case listed in the State Register of Historic Places or the Inventory of Historic and Archaeological Assets of the Commonwealth? ___ Yes _**X**_ No; if yes, does the project involve the demolition of all or any exterior part of such historic structure? ___ Yes ___ No; if yes, please describe:

B. Is any part of the project site an archaeological site listed in the State Register of Historic Places or the Inventory of Historic and Archaeological Assets of the Commonwealth? ___ Yes _**X**_ No; if yes, does the project involve the destruction of all or any part of such archaeological site? ___ Yes ___ No; if yes, please describe:

C. If you answered "No" to all parts of both questions A and B, proceed to the **Attachments and Certifications** Sections. If you answered "Yes" to any part of either question A or question B, fill out the remainder of the Historical and Archaeological Resources Section below.

D. Have you consulted with the Massachusetts Historical Commission? ___ Yes ___ No; if yes, attach correspondence

E. Describe and assess the project's other impacts, direct and indirect, on listed or inventoried historical and archaeological resources:

II. Consistency -- Describe measures that the proponent will take to comply with federal, state, regional, and local plans and policies related to preserving historical and archaeological resources:

ATTACHMENTS:

1. Plan, at an appropriate scale, of existing conditions of the project site and its immediate context, showing all known structures, roadways and parking lots, rail rights-of-way, wetlands and water bodies, wooded areas, farmland, steep slopes, public open spaces, and major utilities. **Attached.**
2. Plan of proposed conditions upon completion of project (if construction of the project is proposed to be phased, there should be a site plan showing conditions upon the completion of each phase). **Attached.**
3. **Original** U.S.G.S. map or good quality **color** copy (8-½ x 11 inches or larger) indicating the project location and boundaries. **Attached.**
4. List of all agencies and persons to whom the proponent circulated the ENF, in accordance with 301 CMR 11.16(2). **See Attachment B (Environmental Notification Form Distribution List).**
5. Other:

CERTIFICATIONS:

1. The Public Notice of Environmental Review has been/will be published in the following newspapers in accordance with 301 CMR 11.15(1):

(Name)	(Date)
Boston Herald	**7/8/09**
East Boston Times	**7/8/09**

2. This form has been circulated to Agencies and Persons in accordance with 301 CMR 11.16(2).

6/30/09 [signature]	6/30/09 [signature]
Date — Signature of Responsible Officer or Proponent	Date — Signature of person preparing ENF (if different from above)
Stewart Dalzell	**Sarah Townsend**
Name (print or type)	Name (print or type)
Massport	**Vanasse Hangen Brustlin, Inc.**
Firm/Agency	Firm/Agency
One Harborside Drive, Suite 200S	**101 Walnut Street, PO Box 9151**
Street	Street
East Boston, MA 02128-2909	**Watertown, MA 02472-9151**
Municipality/State/Zip	Municipality/State/Zip
(617) 568-3524	**(617) 924-1770**
Phone	Phone

Legend

RSA Enhancement Study Area

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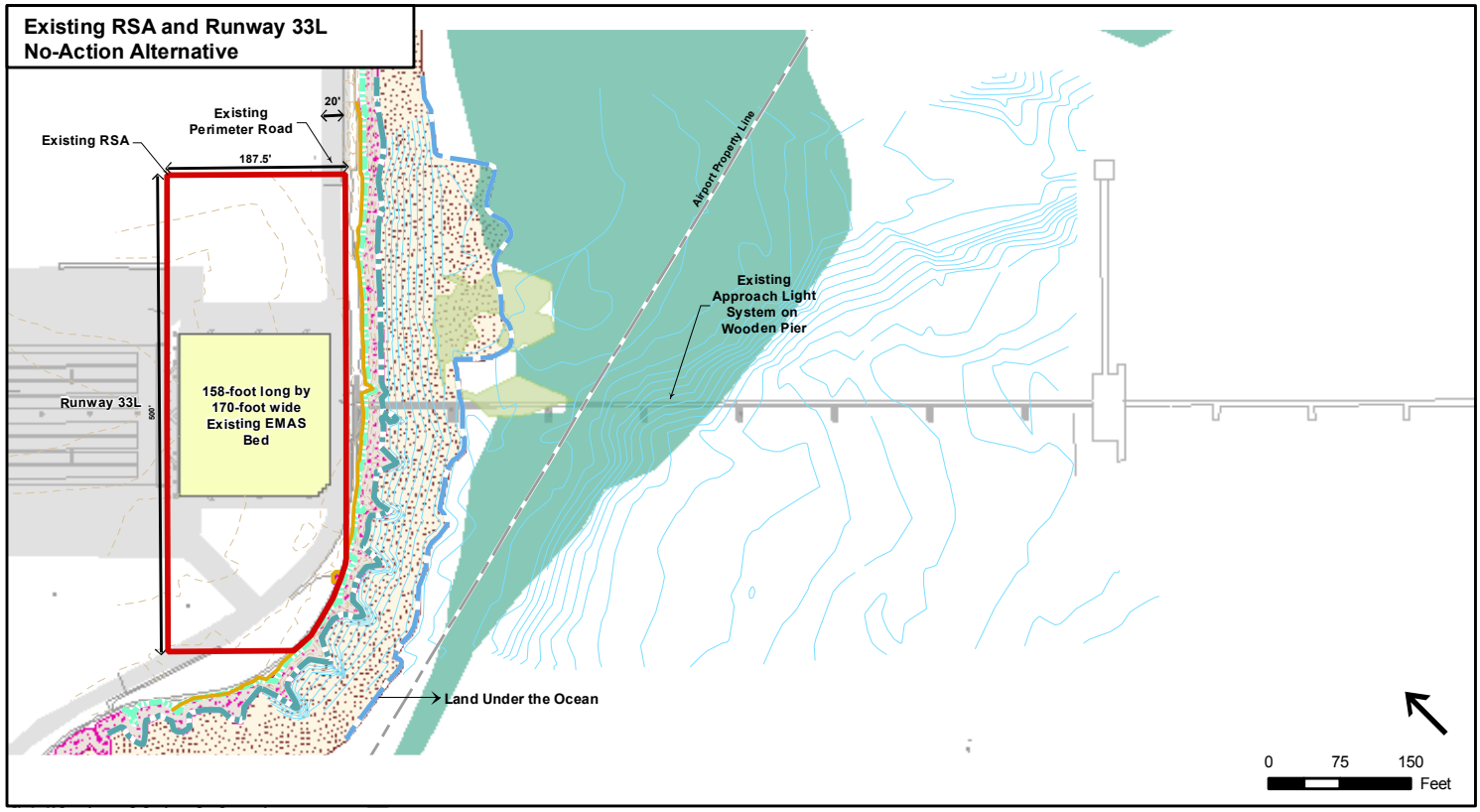
LOGAN AIRPORT RSA
Runway Safety Area Improvements Project

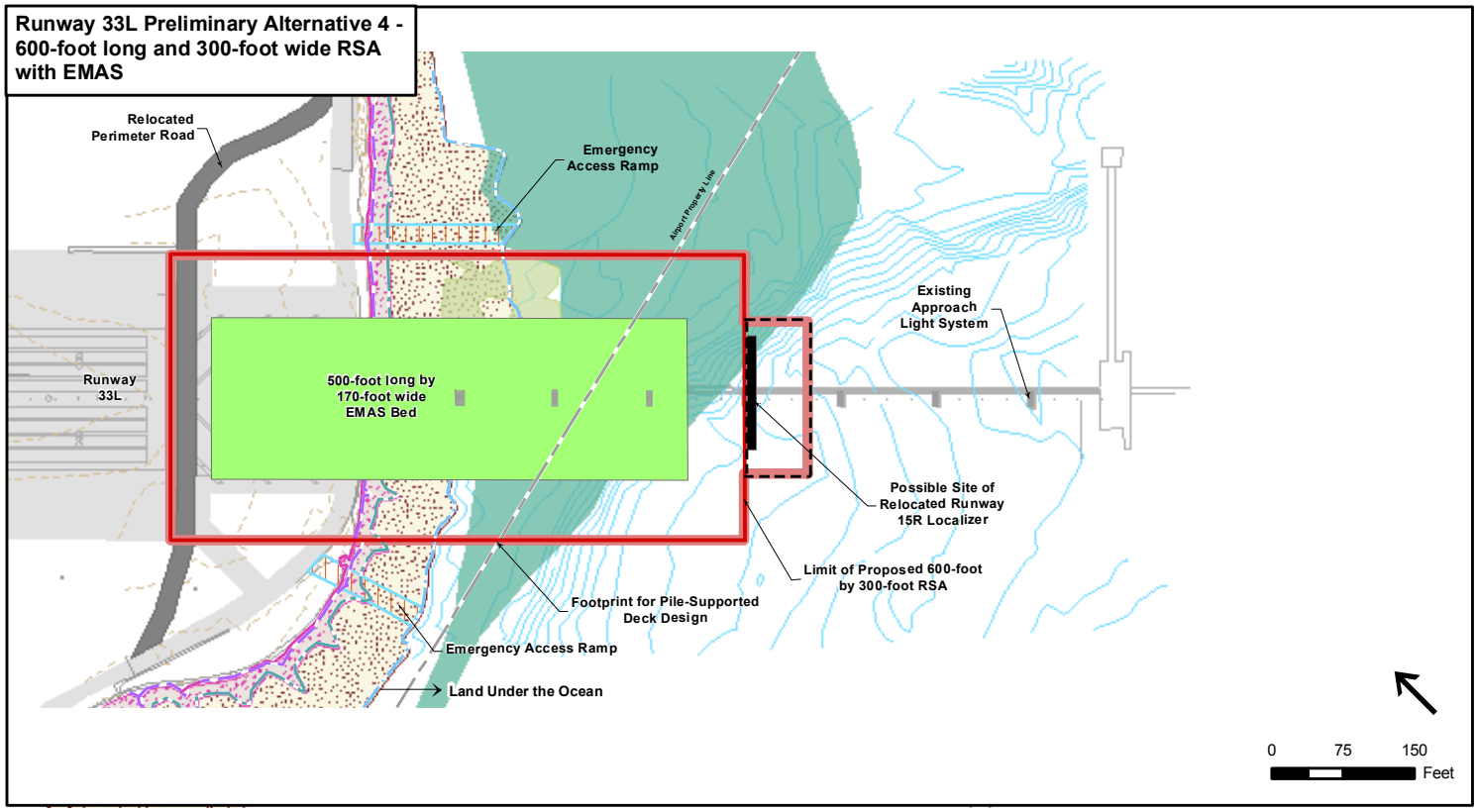
Logan RSA

Location of Proposed RSA Enhancements

0 625 1,250 2,500 Feet

Data Sources:
USGS DRG (1987) - MassGIS





Legend

- Existing EMAS Bed
- New EMAS Bed
- Footprint for Pile-Supported Deck
- RSA Footprint
- Emergency Ramps
- Pile Supported Deck for Localizer
- Existing Bathymetric Contour
- Existing Contour
- Limit of Land Subject to Coastal Storm Flowage
- Mean High Water (4.58')
- Mean Low Water (-4.51')
- Top of Coastal Bank
- Coastal Bank
- Coastal Beach
- Mussel Bed
- Limit of Eelgrass

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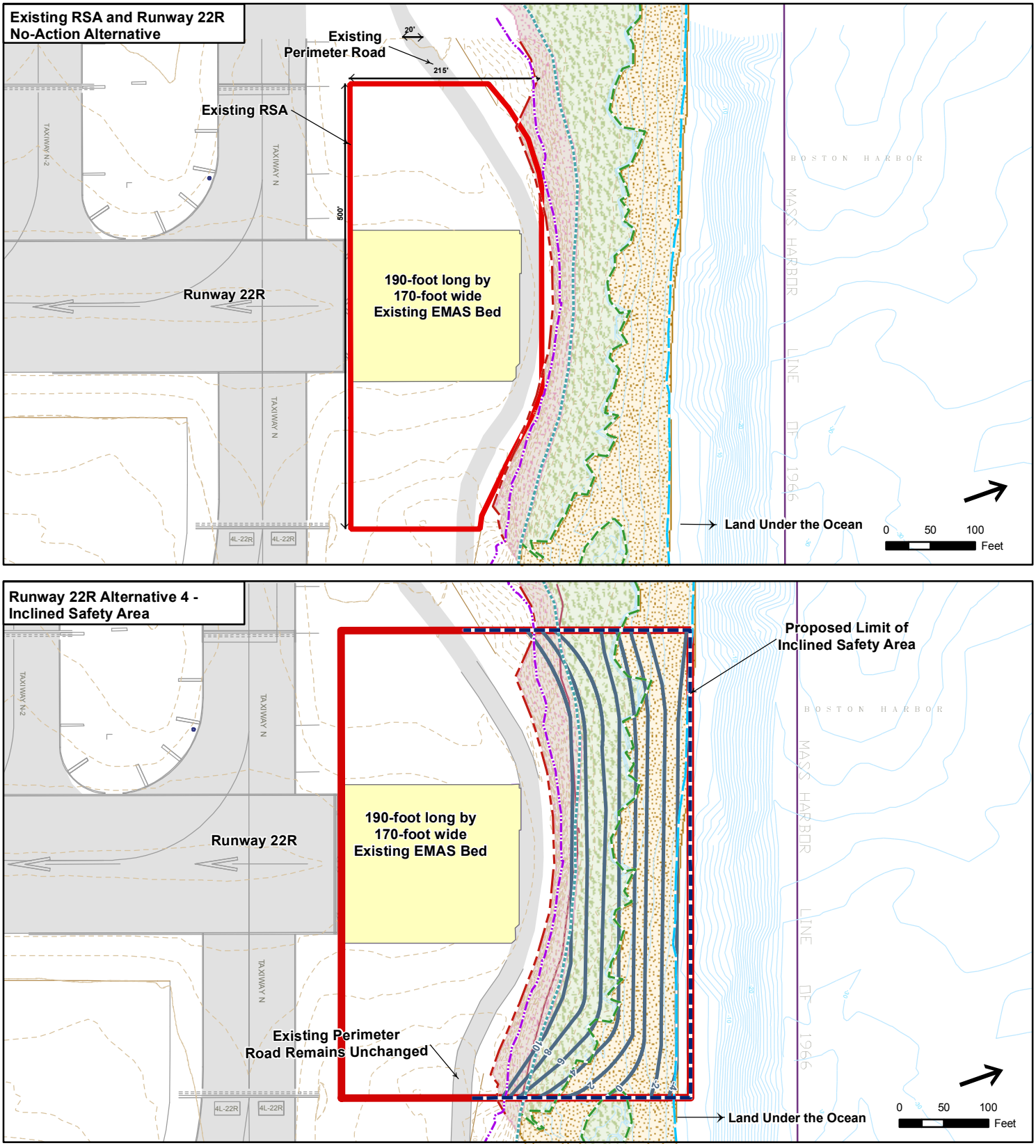
LOGAN AIRPORT RSA
Runway Safety Area Improvements Project

Logan RSA

Existing RSA and Runway 33L No-Action Alternative and Preliminary Alternative 4

Source: Jacobs Edwards & Kelcey, Inc.
Childs Engineering Corps.
Massport - Bathymetric Contours



Legend

- RSA Footprint
- Proposed Contour
- Existing EMAS Bed
- Limit of Inclined Safety Area
- Coastal Bank
- Coastal Beach
- Salt Marsh
- Existing Contour
- Existing Bathymetric Contour
- Approx. Lower Limit of Salt Marsh Vegetation
- Limit of Land Subject to Coastal Storm Flowage
- Mean High Water (4.58')
- Mean Low Water (-4.51')
- Top of Coastal Bank

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Runway Safety Area Improvements Project

L o g a n R S A

Existing RSA and Runway 22R No-Action Alternative and Alternative 4

Source: Jacobs Edwards & Kelcey, Inc.
Childs Engineering Corps.
Massport - Bathymetric Contours

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Runway Safety Area Improvements Project

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LOGAN AIRPORT RSA
Runway Safety Area Improvements Project

Attachment A
Environmental Notification Form
Narrative and Figures

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LOGAN AIRPORT RSA
Runway Safety Area Improvements Project

Boston-Logan International Airport Runway Safety Area Improvements Project

Boston-Logan International Airport
East Boston, Massachusetts

Prepared for **Massachusetts Port Authority**
East Boston, Massachusetts

Prepared by VHB *Vanasse Hangen Brustlin, Inc.*
Watertown, Massachusetts

in association with **Jacobs/Edwards and Kelcey**

June 30, 2009

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LOGAN AIRPORT RSA
Runway Safety Area Improvements Project

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Appendix A Runway Safety Area Determination: Runway 15R-33L General Edward Lawrence Logan International Airport East Boston, Massachusetts (January 30, 2009)

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LOGAN AIRPORT RSA
Runway Safety Area Improvements Project

Acronyms

AC	Advisory Circular
ARC	Airport Reference Code
ARFF	Airport Rescue and Firefighting
BMP	Best Management Practices
CFR	Code of Federal Regulations
CMP	Construction Management Plan
CMR	Code of Massachusetts Regulations
CO	Carbon Monoxide
CZM	Massachusetts Office of Coastal Zone Management
DEP	Massachusetts Department of Environmental Protection
DMF	Massachusetts Division of Marine Fisheries
DNL	Day-Night Levels (sound)
DOT OIG	U.S. Department of Transportation, Office of Inspector General
EA	Environmental Assessment
EEA	Executive Office of Energy and Environmental Affairs (formerly the Executive Office of Environmental Affairs or EOEA)
EFH	Essential Fish Habitat
EIR	Draft Environmental Impact Report
EMAS	Engineered Materials Arresting System
ENF	Environmental Notification Form
FAA	Federal Aviation Administration
FONSI	Finding Of No Significant Impact
GHG	Greenhouse Gas
ILS	Instrument Landing System
MALSR	Medium-Intensity Approach Lighting System with Runway Alignment
MEPA	Massachusetts Environmental Policy Act
MLW	Maximum Landing Weight
MTOW	Maximum Takeoff Weight
Navaid	Navigational aid
NEPA	National Environmental Policy Act
NHESP	Massachusetts Natural Heritage and Endangered Species Program
NMFS	National Marine Fisheries Service

NOx	Nitrogen oxides
NPDES	National Pollutant Discharge Elimination System
PAPI	Precision Approach Path Indicator
PM_{10}	Particulate matter smaller than or equal to 10 microns in diameter
$PM_{2.5}$	Particulate matter smaller than or equal to 2.5 microns in diameter
PRAS	Preferential Runway Advisory System
psi	Pounds per square inch
RPZ	Runway Protection Zone
RSA	Runway Safety Area
SOx	Sulfur oxides
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
VOC	Volatile Organic Compounds
VOR/ DME	Very High Omnidirectional Range/ Distance Measuring Equipment
WPA	Wetland Protection Act

LOGAN AIRPORT RSA
Runway Safety Area Improvements Project

1

Introduction and Project Overview

The Massachusetts Port Authority (Massport) is proposing to enhance the runway safety areas (RSAs) at the ends of Runway 33L and Runway 22R at Boston-Logan International Airport (Logan Airport). The proposed improvements are part of an ongoing safety program and are required to enhance the RSAs, to the extent feasible, to be consistent with the Federal Aviation Administration's (FAA) current airport design criteria[1] for RSAs and to enhance rescue access in the event of an airfield emergency. Typical RSAs at the end of a runway are level areas 1,000 feet long by 500 feet wide but may be shorter in length if an Engineered Materials Arresting System (EMAS)[2] is installed at the runway end. RSAs are safety improvements and do not extend runways or have any effect on normal runway operations, runway capacity, or types of aircraft that can use the runways.

In accordance with the Massachusetts Environmental Policy Act (MEPA) Regulations, 301 Code of Massachusetts Regulations (CMR) 11.00, Massport has prepared this Environmental Notification Form (ENF), which describes the proposed enhancements to the RSAs at the ends of Runway 33L and Runway 22R, their potential environmental impacts, and preliminary mitigation strategies. An ENF is required because the proposed RSA enhancements exceed review thresholds in 301 CMR 11.03(3), specifically those related to wetlands, waterways, and tidelands.

This narrative describes the purpose of, and need for, the proposed RSA enhancements, the alternatives considered, and the potential environmental impacts. The narrative contains:

- **Chapter 1, Introduction and Project Overview** describes Logan Airport, provides an introduction and overview of airport safety, provides a history of efforts leading up to this phase of proposed RSA enhancements, and describes the FAA National Environmental Policy Act (NEPA) process.

1 United States Department of Transportation, Federal Aviation Administration, Advisory Circular (AC) 150/5300-13, Airport Design, Changes 1 through 13, June 19, 2008.

2 An EMAS bed is constructed of collapsible concrete blocks with predictable deceleration forces. When an aircraft rolls into an EMAS bed, the tires of the aircraft collapse the lightweight concrete, and the aircraft is slowed down to a safe stop in a way that minimizes damage to the aircraft.

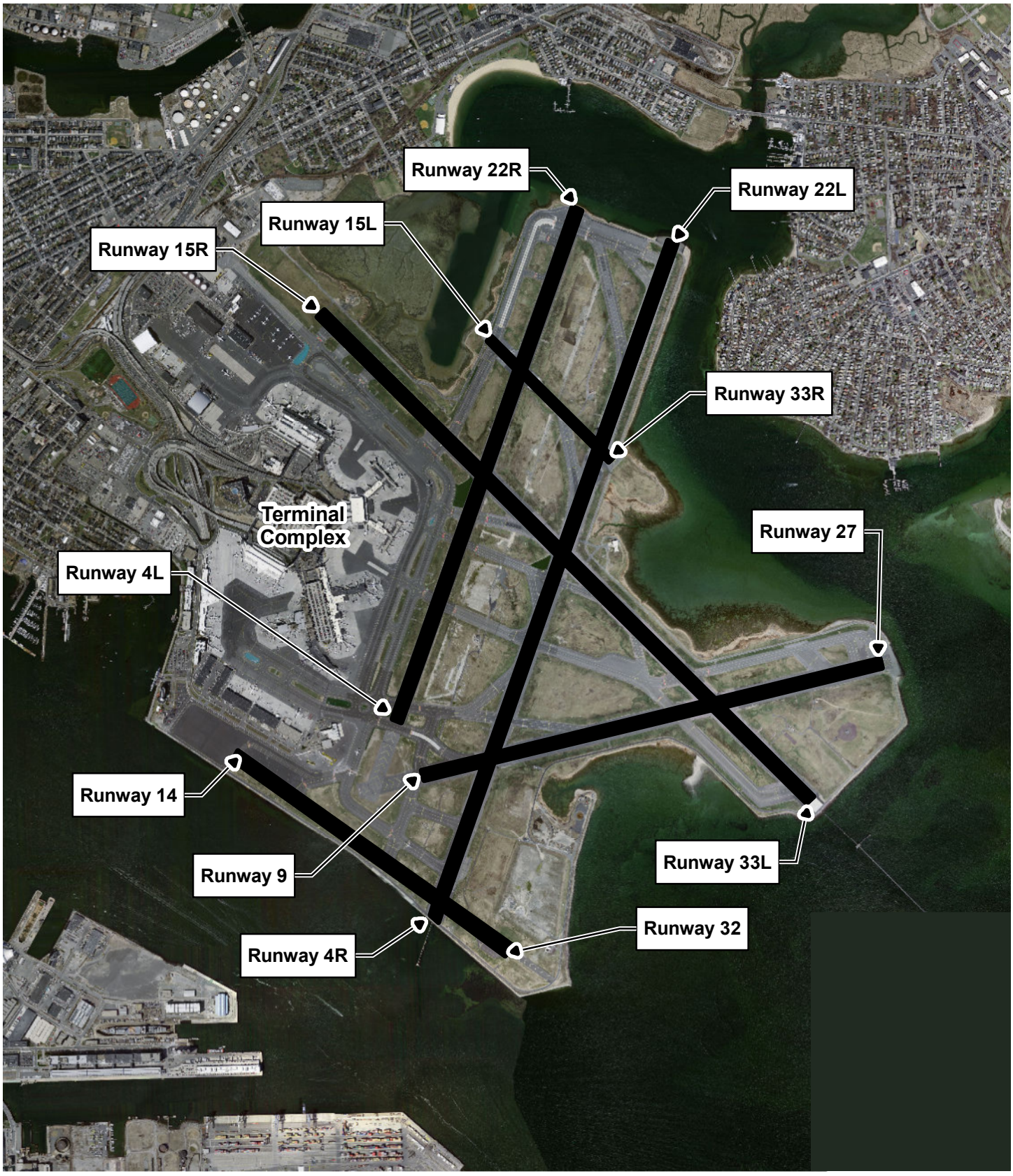
- **Chapter 2, Purpose and Need** describes the purpose of, and need for, the proposed enhancements to the RSAs at the ends of Runway 33L and Runway 22R, and describes the FAA's current airport design criteria for RSAs.
- **Chapter 3, Alternatives Considered** describes the existing Runway 33L, Runway 22R, and existing associated RSAs, and the process undertaken by Massport to identify reasonable alternatives for the proposed safety enhancements.
- **Chapter 4, Description of Environmental Resources, Impacts, and Permits Required** describes the existing environmental conditions at the ends of Runway 33L and Runway 22R, addresses environmental resources that could potentially be impacted or that would not be impacted by the proposed RSA enhancements, and identifies the regulatory permits required for each project.
- **Chapter 5, Proposed Scope for the Draft EA/EIR** provides a suggested scope for the Draft Environmental Assessment (EA)/ Environmental Impact Report (EIR).

1.1 Logan Airport

Logan Airport, owned and operated by Massport, is New England's primary international and domestic airport. According to the FAA, Logan Airport was the 17th busiest commercial aviation facility in the United States based on aircraft operations in 2008.[3] Logan Airport had 377,604 operations and served a total of 26.1 million passengers in 2008, down from 28.1 million in 2007.[4] In 2008, over 50 airlines provided scheduled or charter passenger service from Logan Airport to more than 120 international and domestic destinations. Logan Airport serves as the long-haul international gateway for the New England Region and had non-stop service to 47 international destinations in 2007, including points in Europe, the Middle East, Canada, Central and South America, Bermuda, and the Caribbean.[5] Nearly four million passengers traveled to and from international destinations in 2008, representing 15.2 percent of total passengers at Logan Airport. Logan Airport has a diverse fleet mix, accommodating turboprops and heavy, light, and regional jets.

Logan Airport includes approximately 2,400 acres in East Boston and Winthrop, including 700 acres of Boston Harbor. Logan Airport, shown in Figure 1-1, is one of the most land-constrained airports in the nation and is surrounded on three sides by Boston Harbor. The airport has been incrementally constructed by filling portions of the harbor. The airfield has six runways, 14 miles of taxiways, and approximately 240 acres of concrete and asphalt aprons. Logan Airport has four passenger terminals (Terminal A, B, C, and E), each with its own ticketing, baggage claim, and ground transportation facilities.

3 http://www.faa.gov/news/updates/busiest_airports/index.cfm accessed August 8,2008.
4 Massachusetts Port Authority, *Boston-Logan International Airport 2007 Environmental Data Report*, September 2008.
5 *ibid.*



Logan RSA

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LOGAN AIRPORT RSA
Runway Safety Area Improvements Project

Figure 1-1

Logan Airport

0 625 1,250 2,500 Feet

Data Sources:
2008 Aerial Photography - MassGIS

1.2 Airport Safety

Airport safety and security is the highest priority of the FAA. As stated in FAA Order 5100-38B, *Airport Improvement Program Handbook*, "The highest aviation priority of the United States is the safe and secure operation of the airport and airway system. The FAA supports this policy by giving the highest priority to projects that enhance the safety and security of our airport system." RSAs are the most critical safety features on an airfield, and accordingly, FAA gives the highest priority to constructing, extending, or improving RSAs.[6] As described by the FAA, an RSA is a flat surface surrounding the runway that is clear of obstructions such as trees, terrain, or other objects and is designed to reduce the risk of damage to aircraft in the event of an unintentional "excursion" from the runway during landing or takeoff.

As the owner and operator of Logan Airport, Massport's primary focus is also on safety and security. Safety is integrated into all aspects of planning, development, construction, and operation of Logan Airport. Aviation safety requirements are constantly evolving and are subject to ongoing re-evaluation and enhancement. Like many established airports, Logan Airport was built over many years and today is subject to different design and safety standards than were in effect when the airport was first constructed. In particular, the current design criteria, contained in the FAA's Airport Design Advisory Circular[7] for RSAs (see Section 2.2 of this narrative) represent a significant upgrade over earlier standards. As the FAA's design criteria have evolved, Massport has continued to improve its RSAs as part of an ongoing program of airfield safety enhancements at Logan Airport. Section 1.3 of this report describes the efforts that Massport has taken to date to enhance the RSAs at the ends of Runway 33L and Runway 22R.

1.3 Background

Over the years, Massport has enhanced a number of the RSAs at the airport. In the early 1990s, RSA enhancements in the form of inclined safety areas were constructed at the ends of Runways 22L and 27. The inclined safety areas consist of 500-foot by 400-foot inclined crushed stone ramps that extend beyond the runway threshold and into Boston Harbor. The inclined safety areas provide a graded transition surface at the end of the runway that allows an aircraft that overruns the end of the runway to make a gradual transition into the water. These inclined safety areas were installed by Massport prior to the current FAA criteria on RSA designs and do not officially constitute an RSA under FAA's current regulations. Additionally, as part of the project in the early 1990s, Massport installed a rescue access ramp between Runway Ends 4L and 4R to enhance rescue access to Boston Harbor along the main shipping channel. Enhancements that have been made to the RSAs at the ends of Runway 33L and Runway 22R are described in the following sections.

6 United States Department of Transportation, Federal Aviation Administration, *Order 5100.38C, Airport Improvement Program Handbook*, June 28, 2005, p.37.
7 United States Department of Transportation, Federal Aviation Administration, *Advisory Circular (AC) 150/5300-13, Airport Design, Changes 1 through 13,* June 19, 2008.

1.3.1 Runway 33L

In the early 1990s, Massport obtained state and federal approvals to proceed with a Runway End Safety Improvements Project, which consisted of safety area improvements to RSAs at the ends of Runways 22L, 4L/ 4R, 27, and 33L. Improvements to the Runway 22L, 4L/ 4R, and 27 RSAs have been completed. However, the improvements to the Runway 33L RSA were not implemented due to concerns by pilots related to the transition between the proposed inclined safety area and the remaining light pier. These initiatives were begun prior to FAA's issuance of its RSA Program in Order 5200.8, October 1, 1999, and subsequent updates in Order 5200.9 on March 15, 2004[8] and Advisory Circular (AC) 150/ 5220-22A on EMAS dated September 30, 2005.[9] Massport has continued to work with the FAA's latest guidelines to develop an alternative that would meet the needs of users, minimize potential environmental impacts, and be practicable from safety, operational, and cost perspectives.

In November 2005, Congress, in consultation with FAA, mandated that all Part 139 airport sponsors enhance passenger safety by improving their airport's RSAs by 2015 and that FAA report annually on its progress toward improving RSAs.[10] Part 139 airports are those that conduct commercial passenger flight operations. Since commercial passenger flight operations are conducted at Logan Airport it is a Part 139 airport, and therefore the FAA and Massport are required to improve RSAs at Logan Airport by 2015. In response to this mandate by Congress, Massport commissioned an evaluation of alternatives for improving the RSA at the end of Runway 33L in 2005.[11] Based on the results of the alternatives evaluation, Massport installed a 158-foot long and 170-foot wide EMAS bed within the RSA at the end of Runway 33L in 2006. An EMAS bed is constructed of collapsible concrete blocks with predictable deceleration forces. When an aircraft rolls into an EMAS bed, the tires of the aircraft collapse the lightweight concrete, and the aircraft is slowed down in a way that minimizes damage to the aircraft.

Runway 33L's existing RSA/ EMAS does not meet the FAA's standard for a typical RSA (1,000-foot long RSA) or RSA/ EMAS (600 feet long RSA with EMAS) for the design aircraft, the Boeing 747. The existing EMAS bed is constructed of 60 pound per square inch (psi) strength blocks and is capable of arresting a Boeing 757-200 exiting the runway at a speed of 38 knots or less and a Boeing 737-800 at 42 knots or less.[12] However, Massport considered, and FAA agreed, that based on the experience at other airports, even a short section of EMAS was a significant improvement over then existing conditions at this location and would serve as a meaningful interim measure pending design and permitting of the more complete solution proposed in this ENF filing.

8 United States Department of Transportation, Federal Aviation Administration, *Order 5200.9, Financial Feasibility and Equivalency of Runway Safety Area Improvements and Engineered Material Arresting Systems*, March 15, 2004.
9 United States Department of Transportation, Federal Aviation Administration, *Advisory Circular 150/5220-22A, Engineered Materials Arresting Systems (EMAS) for Aircraft Overruns*, September 30, 2005.
10 United States Department of Transportation, Office of Inspector General, *Actions Taken and Needed to Improve FAA's Runway Safety Program*, March 3, 2009, p. 1.
11 SH&E, Inc, Edwards and Kelcey, Inc., Flight Transportation Associates, Inc., *Massport Runway 15R-33L Safety Area Study*, December 2005.
12 Engineered Arresting Systems Corp. (ESCO), *Final Design Report for an EMAS at Runway 33L End at Logan International Airport in East Boston, MA*, August 24, 2006, pp. 9 - 10.

1.3.2 Runway 22R

In 2004, Massport was preparing to rehabilitate Runway 4L-22R to repair the runway's 17-year-old pavement with a new asphalt overlay. In accordance with Title 14, Code of Federal Regulations (14 CFR), Part 139.309(a)(2), *Certification of Airports*, Massport was required to evaluate the runway's RSAs since the Runway 22R end did not meet FAA airport design criteria (Section 2.2 of this narrative). Massport commissioned an evaluation of alternatives for improving the RSA at the end of Runway 22R (see Section 3.2.2.2 of this narrative).

The analysis found that "EMAS installation would enhance safety compared to the existing RSA, while maintaining the full operating capability of Runway 4L-22R [but that] this near-term safety enhancement does not preclude future improvements. In the intermediate and long term, Massport should continue to explore additional RSA safety enhancement options. These may include a longer EMAS bed, an inclined safety area, or other RSA enhancement options that may be subsequently identified."[13]

In its review of this recommendation, FAA supported installation of an EMAS bed within the RSA at the end of Runway 22R, but directed Massport to evaluate opportunities to further enhance safety.[14] In 2005, Massport installed a 190-foot long and 170-foot wide EMAS bed within the existing Runway 22R RSA. That EMAS bed is constructed of 60 psi strength blocks and meets the FAA's current design standard for stopping the design aircraft for Runway 22R (Boeing 757-200) at the minimum arrestment speed of 40 knots.

1.4 FAA NEPA Process

Federal environmental review of the proposed RSA enhancements is the responsibility of the FAA. As a source of funding of the proposed enhancements, the FAA is required to conduct an environmental evaluation of the proposed RSA enhancements under NEPA. FAA plans to prepare an EA for the proposed RSA enhancements in accordance with the requirements of FAA's NEPA regulations (FAA Order 1050.1E, *Environmental Impacts Policies and Procedures*, and FAA Order 5050.4B, *National Environmental Policy Act (NEPA) Implementing Instructions for Airport Actions*). FAA will also need to approve any modifications to the Airport Layout Plan. As part of such review, FAA will review the proposed enhancements with respect to its own standards. Massport plans to prepare a combined Draft EA/ EIR which will meet the requirements of both NEPA and MEPA.

13 SH&E, Inc. and Flight Transportation Associates, Inc., Runway 4L/22R Safety Area Analysis, March 29, 2004.
14 Federal Aviation Administration, Runway Safety Area Determination: General Edward Lawrence Logan International Airport East Boston, Massachusetts, June 6, 2004, p. 1.

LOGAN AIRPORT RSA
Runway Safety Area Improvements Project

2
Purpose and Need

This chapter describes the purpose of and need for the proposed RSA enhancements and describes the FAA airport design criteria for RSAs.

2.1 Purpose of the Project

The purpose of the project is to increase safety for aircraft and their passengers in emergency situations by enhancing the RSAs at the ends of Runway 33L and Runway 22R consistent with FAA's guidelines.

2.2 FAA Design Criteria for Runway Safety Areas

The FAA requires airports to provide a safety area at runway ends and on the sides of a runway to reduce the risk of damage to aircraft in the event of an unintentional "excursion" from the runway in an emergency situation. An "excursion" from the runway can include an overrun (an arriving aircraft fails to stop before the end of the runway), an undershoot (an aircraft arriving on a runway touches down before the start of the paved runway surface), or a veer-off to one side of a runway. The FAA requires that airports that receive federal funding for airport improvement projects and commercial service airports, regulated under 14 CFR Part 139, *Certification of Airports*, provide standard RSAs where possible.

The design criteria for RSAs are provided in the FAA's *Advisory Circular 150/5300-13, Airport Design*, June 19, 2008.[15] The FAA Airport Design Advisory Circular contains a coding system, referred to as the Airport Reference Code (ARC), which standardizes design requirements for airports. The ARC contains design requirements for the length and width of runways and taxiways, and requirements for the associated RSAs, all of which are based on the type of aircraft that currently, or are expected to use the airport in the future. The

15 United States Department of Transportation, Federal Aviation Administration, *Advisory Circular (AC) 150/5300-13, Airport Design, Changes 1 through 13,* June 19, 2008.

ARC is an alphanumeric code that categorizes various aircraft based upon the approach speed (alpha) and wingspan (numeric); the higher the alphanumeric code, the larger and more demanding the aircraft. An ARC of A-I defines the design dimensions for small airports that serve small single and multi-engine aircraft, while an ARC of D-V defines the design dimensions for larger airports that serve large multi-engine commercial service aircraft.[16] Runways, taxiways, and associated safety areas are designed to accommodate the design aircraft, which is the most demanding aircraft (the aircraft with the highest landing speed and longest wingspan) expected to use an airport on a regular basis, now or in the future.[17]

The Boeing 747-400, which falls into one of the highest ARC categories and groups (D-V), is the design aircraft for Runway 15R-33L.[18] The Boeing 757-200 is the design aircraft for Runway 4L-22R and falls into the midrange of ARC categories and groups (C-IV).[19] The standard RSA for both of these large commercial service aircraft is 1,000 feet long and 500 feet wide at each runway end. FAA standards require that RSAs are:[20]

- Cleared and graded with no potentially hazardous ruts, humps, depressions, or other surface variations.
- Drained by grading to prevent water accumulation.
- Capable under dry conditions of supporting snow removal and aircraft rescue fire fighting (ARFF) equipment, and the occasional passage of aircraft without causing significant damage to the aircraft.

At airports where space is limited and land is not available to accommodate the standard 1,000-foot long by 500-foot wide RSAs, the FAA has approved the use of EMAS to provide overrun protection. EMAS is a bed of collapsible concrete blocks with predictable deceleration forces. In an emergency situation, when an aircraft rolls into an EMAS bed, the tires of the aircraft collapse the lightweight concrete, and the aircraft is slowed down in a way that minimizes damage to the aircraft.[21] FAA Order 5200.9, *Financial Feasibility and Equivalency of Runway Safety Area Improvements and Engineered Materials Arresting Systems*, states that EMAS should provide "protection against overruns by the design aircraft exiting the runway at 70 knots (but no less than 40 knots)."[22] The FAA has determined that an EMAS bed with a 70-knot arrestment speed (based on the design aircraft) provides a level of safety that is generally equivalent to a full 1,000-foot long RSA.

The standard 1000-foot long RSA can be reduced to 600 feet if an EMAS system is installed and if the runway has either instrument or visual vertical guidance for approaches in the opposite direction. If the runway does

16 Edwards and Kelcey, Inc., *Massport Runway 15R-33L Safety Area Study Technical Report,* December 2005, p. 03-1.
17 *ibid.*
18 SH&E, Inc, Edwards and Kelcey, Inc., Flight Transportation Associates, Inc., *Massport Runway 15R-33L Safety Area Study*, December 2005, pp. 03-1-03-3 and 05-9.
19 SH&E, Edwards and Kelcey, and Flight Transportation Associates, *Runway 4L/22R Safety Area Analysis*, March 29,2004.
20 United States Department of Transportation, Federal Aviation Administration, *Advisory Circular (AC) 150/5300-13*, *Airport Design*, Changes 1 through 13, June 19, 2008.
21 Federal Aviation Administration Fact Sheet, *Engineered Material Arresting System (EMAS)*, June 15, 2007.
22 U.S. Department of Transportation, Federal Aviation Administration, FAA Order 5200.9, *Financial Feasibility and Equivalency of Runway Safety Area Improvements and Engineered Materials Arresting Systems*, March 15, 2004, p. 4, Paragraph 7b.

not have vertical guidance, the RSA would need to be 1,000 feet in length to meet the design criteria in the FAA Airport Design Advisory Circular.[23]

Table 2-1 summarizes the design criteria, as per the FAA Airport Design Advisory Circular,[24] for the RSAs at the ends of Runway 33L and Runway 22R where enhancements are proposed.

2.3 Need for the Project

Logan Airport is a commercial service airport that receives federal funding for airport improvement projects and therefore is required by the FAA to meet the RSA design criteria contained in the FAA Airport Design Advisory Circular,[25] to the extent feasible.

The existing RSA at the end of Runway 33L does not meet current FAA design criteria (Table 2-1) for overrun and undershoot protection for the runway's design aircraft, the Boeing 747-400. The existing RSA is 187.5 feet long and 500 feet wide. Within this area is a 158-foot long and 170-foot wide EMAS bed, installed in 2006 as an interim safety measure. The existing EMAS bed is constructed of 60 pounds per square inch (psi) strength blocks and is capable of arresting a Boeing 757-200 exiting the runway at a speed of 38 knots or less or a Boeing 737-800 at 42 knots or less,[26] but provides minimal arrestment of the design aircraft, the Boeing 747-400. The existing Runway 33L RSA also does not provide undershoot protection consistent with the FAA criteria. There is a need to enhance the Runway 33L RSA so that it provides overrun and undershoot protection consistent with the current design criteria in the FAA's Airport Design Advisory Circular (Table 2-1) [27] to the extent feasible.

On March 3, 2009, the United States Department of Transportation Office of Inspector General (DOT OIG) released a report entitled *Actions Taken and Needed to Improve FAA's Runway Safety Program*. The report indicates that, while FAA has made significant progress in improving RSAs as required by the 2005 mandate by Congress (described in Section 1.3.1 of this narrative), further action is needed. The DOT OIG report made specific recommendations, including proposals that FAA take action at 11 of the nation's largest airports.[28]
Logan Airport was one of the 11 airports that the DOT OIG identified as requiring further action to improve RSAs. Specifically, the DOT OIG acknowledged installation of the existing EMAS bed by Massport in 2006 as an interim safety measure for Runway 33L, but stated that FAA and Massport should complete the full RSA

23 United States Department of Transportation, Federal Aviation Administration, *Advisory Circular (AC) 150/5300-13, Airport Design, Changes 1 through 13,* June 19, 2008.
24 *ibid.*
25 *ibid.*
26 Final Design Report for an EMAS at Runway 33L End at General Logan International Airport in East Boston, MA, Engineered Arresting Systems Corp. (ESCO), August 24, 2006, pp. 9 - 10.
27 United States Department of Transportation, Federal Aviation Administration, *Advisory Circular (AC) 150/5300-13, Airport Design, Changes 1 through 13,* June 19, 2008.
28 United States Department of Transportation, Office of Inspector General, Actions Taken and Needed to Improve FAA's Runway Safety Program, March 3, 2009, p. 3.

improvements as soon as possible.[29] In accordance with the 2005 mandate by Congress, the enhancement of the Runway 33L RSA must be complete by 2015.

The existing RSA at the end of Runway 22R meets the minimum FAA design criteria for overrun protection for the runway's design aircraft, the Boeing 757-200. The RSA is 215 feet long and 500 feet wide, and includes a 190-foot long and 170-foot wide EMAS bed constructed of 60 psi strength blocks. The EMAS bed provides the minimum arrestment speed acceptable by the FAA (40 knots) for the design aircraft, the Boeing 757-200. The Runway 22R EMAS bed also provides arrestment at higher speeds for many of the smaller aircraft frequently using this runway. The arresting performance improves with lighter aircraft. The EMAS bed will arrest a Boeing 737-800 that leaves the runway at 51 to 57 knots and a CRJ-200 that leaves the runway at 60 to 66 knots.[30] As a condition of approving the installation of the existing EMAS bed, the FAA required Massport to consider options for further enhancing the level of safety provided by the existing RSA.[31]

Consistent with this request, Massport has considered options for enhancing the level of safety of the existing RSA for both overruns (aircraft landing on Runway 4L and exiting the runway at the Runway 22R end) and undershoots (aircraft landing short on Runway 22R). The EMAS system currently installed on Runway 22R complies with the FAA minimum for arrestment speeds. The FAA and Massport determined that the undershoot requirement is mitigated by the operational use of Runway 22R and its geometry. In reviewing the layout and functionality of Runway 22R, historically this runway has very rarely been used for arrivals. In addition, its arrival threshold is displaced 815 feet from the actual end of the runway. While this 815-foot displacement area is available for Runway 4L arrival roll-out and Runway 22R departures, it is not available for Runway 22R arrivals and according to the FAA can be used to satisfy undershoot requirements. The remaining requirement for vertical guidance has been satisfied through the installation of a Precision Approach Path Indicator (PAPI). Therefore, the Runway 22R RSA is intended to protect aircraft in the event that an aircraft arriving on Runway 4L overruns and fails to stop on the runway.

The location of the proposed RSA enhancements is shown in Figure 2-1.

29 United States Department of Transportation, Office of Inspector General, Actions Taken and Needed to Improve FAA's Runway Safety Program, March 3, 2009, p. 11.
30 SH & E, Inc, Edwards and Kelcey, Inc., Flight Transportation Associates, Inc., Runway 4L/22R Safety Area Analysis, March 29, 2004, p. 16.
31 Federal Aviation Administration, Runway Safety Area Determination: General Edward Lawrence Logan International Airport East Boston, Massachusetts, June 6, 2004, p. 1.

Legend

RSA Enhancement Study Area

massport

LOGAN AIRPORT RSA
Runway Safety Area Improvements Project

Logan RSA

Figure 2-1

Location of Proposed RSA Enhancements

0 625 1,250 2,500 Feet

Data Sources:
USGS DRG (1987) - MassGIS

Table 2-1 FAA Design Criteria for Runway 33L and Runway 22R RSAs

FAA Design Criteria	Runway 33L RSA[1]	Runway 22R RSA[2]
Conventional RSA	1,000 feet long and 500 feet wide	1,000 feet long and 500 feet wide
RSA with EMAS Bed[3]		
RSA	600 feet long and 500 feet wide	600 feet long and 500 feet wide
EMAS Bed		
With 60 psi Strength Blocks	352 feet long (40-knot arrestment speed EMAS bed)[1] and 150 feet wide[4, 5]	190 feet long (40-knot arrestment speed EMAS bed)[4] and 150 feet wide[4, 6]
	676 feet long (70-knot arrestment speed EMAS bed)[2] and 150 feet wide[4, 5]	466 feet long (70-knot arrestment speed EMAS bed)[4] and 150 feet wide[4, 6]
With 80 psi Strength Blocks	500 feet long (70-knot arrestment speed EMAS bed)[2] and 150 feet wide[4]	Not Applicable (based upon fleet mix and design aircraft)

1. The RSA must provide overrun and undershoot protection for the design aircraft, the Boeing 747-400 (ARC D-V).
2. The RSA must provide overrun protection for the design aircraft, the Boeing 757-200 (ARC C-IV).
3. The EMAS bed is constructed within the footprint of the overall RSA length and width. The EMAS bed footprint is typically smaller than the overall RSA dimensions.
4. The minimum width of the EMAS must be the width of the runway (plus any sloped area as necessary). For Runways 33L and 22R a width of at least 150 feet is required.
5. SH&E, Inc, Edwards and Kelcey, Inc., Flight Transportation Associates, Inc., *Massport Runway 15R-33L Safety Area Study*, December 2005, p. 05-11.
6. Vanasse Hangen Brustlin, Inc. and Jacobs Edwards and Kelcey, Inc., *Draft Runway 22R Safety Area Improvements Alternatives Feasibility Study Technical Report,* July 24, 2007.

This project would fulfill an overriding public interest. The public interest served is safety. Safety enhancements to the RSAs reduce the potential for injury to passengers, aircraft crew, and airport employees. RSAs reduce the risk of damage to aircraft and injury to persons inside the aircraft should the aircraft overrun, undershoot, or veer off the runway. RSAs also provide additional safety in comparison to existing conditions during less-than-ideal weather conditions, when it is more likely that an aircraft will need additional distance to land.

3

Alternatives Considered

This chapter describes the existing Runway 33L and Runway 22R, their RSAs, and the process undertaken by Massport and FAA to identify reasonable alternatives for enhancing the RSAs. RSAs are safety improvements and do not extend runways or have any effect on normal runway operations, runway capacity, or types of aircraft that can use the runways.

3.1 Runway 33L

Section 3.1.1 provides a description of Runway 33L and its use. Section 3.1.2 presents the design criteria used to develop alternatives for RSA enhancement, describes the screening criteria applied to each alternative, provides a description of the RSA alternatives considered by Massport for Runway 33L, and identifies the alternatives to be carried forward for analysis in the Draft EA/ EIR.

3.1.1 Description and Use of Runway 33L

At 10,083 feet, Runway 15R-33L is the longest of Logan Airport's six runways. As shown on Figure 1-1, the Runway 15R end is at the western edge of the airfield, and the Runway 33L end is at the eastern edge. Runway 15R has a displaced threshold, which is a runway threshold that is located at a point other than the physical beginning or end of a paved runway surface. Displaced thresholds are typically used to give arriving aircraft adequate clearance over an obstruction while still allowing departing aircraft the maximum amount of runway available for take-offs. Displaced thresholds may also be introduced for noise abatement purposes. In the case of Runway 15R, the displaced threshold is located 880 feet from the end of the runway, which reduces the length of runway available for arrivals by 880 feet; therefore, the landing length available on Runway 15R is 9,203 feet. The departure length for Runway 15R remains at 10,083 feet. The 880-foot runway threshold is in place to give aircraft arriving on Runway 15R clearance over obstructions in East Boston (an elevated highway). The displaced threshold has no impact on arriving or departing aircraft using Runway 33L which can use the full 10,083-foot length. In its current configuration, Taxiway C intersects Runway 33L approximately 200 feet west of the runway end. Because of this geometry, aircraft that need the full runway length for takeoff must

back-taxi to use the last 200 feet of the runway. As part of the planning for the RSA enhancements at this location, Massport and FAA will evaluate opportunities to reconfigure the taxiway/ runway connection to minimize the future back-taxi needs.

Runways 15R and 33L are used for both arrivals and departures. In 2007, 4 percent of all jet aircraft departures and 1 percent of all jet aircraft arrivals occurred on Runway 15R, while 19 percent of all jet aircraft departures and 11 percent of all jet aircraft arrivals occurred on Runway 33L (Table 3-1).[32]

Table 3-1 Runway Use by Jet Aircraft (2007)[3]

	Runway[1]									
	4L	**4R**	**9**	**14[2]**	**15R**	**22L**	**22R**	**27**	**32[2]**	**33L**
Departures	0%	5%	31%	<0.1%	4%	1%	33%	7%	NA	19%
Arrivals	5%	31%	0%	NA	1%	15%	0%	36%	2%	11%

Source: Massachusetts Port Authority, *Boston-Logan International Airport 2007 Environmental Data Report*, September 2008.
1. Jet aircraft are not able to use Runway 15L or 33R due to its length of 2,557 feet.
2. Runway 14-32 opened in December 2006. (Runway 14-32 is unidirectional with no arrivals to Runway 14 and no departures from Runway 32).
3. Note; 2008 Runway Use by Jet Aircraft not available as of date of this report

Runway 15R-33L is the runway that is used by the majority of heavy aircraft serving international and national destinations. Although Runway 15R-33L accommodates a number of different aircraft, including turboprops and heavy, light, and regional jets (Table 3-2), it is the longest runway at Logan Airport and is designed to handle heavy long-haul commercial jet aircraft (Boeing 747 and 777) serving international markets in Europe/ Middle East, Canada, Central/ South America, Bermuda/ Caribbean, and Asia/ Pacific. Runway 15R-33L is also the critical runway for expected, long-haul international service to destinations in Asia including Beijing, Shanghai, and Tokyo. In 2007, Logan Airport accommodated 38,835 international operations, representing 10 percent of the total aircraft operations in 2007 (399,537).[33] Runway 33L is also favored by heavy jet aircraft because it has few obstructions. In 2007, Runway 15R-33L accommodated 22.0 percent of the heavy commercial jet aircraft operations during the day and 38.6 percent of those at night. Runway 15R-33L is the preferred over-water arrival and departure runway for night-time operations by heavy, wide-body commercial jets, and is used by the FAA air traffic control tower to meet noise abatement Preferential Runway Advisory System (PRAS) goals.[34] Table 3-2 shows the mix of aircraft using Runway 15R-33L.

32 Massachusetts Port Authority, *Boston-Logan International Airport 2007 Environmental Data Report*, September 2008.
33 *ibid.*
34 PRAS is a computer program that recommends to the FAA air traffic controllers runway configuration options that will meet weather and demand requirements and provide an equitable distribution of the airport's noise impacts on surrounding communities. The primary objectives of the PRAS are to distribute noise in accordance with annual runway utilization goals, and to provide short-term relief from continuous operations over the same neighborhoods at the ends of the runways.

Table 3-2 Runway 15R-33L Aircraft Fleet Mix (2007)

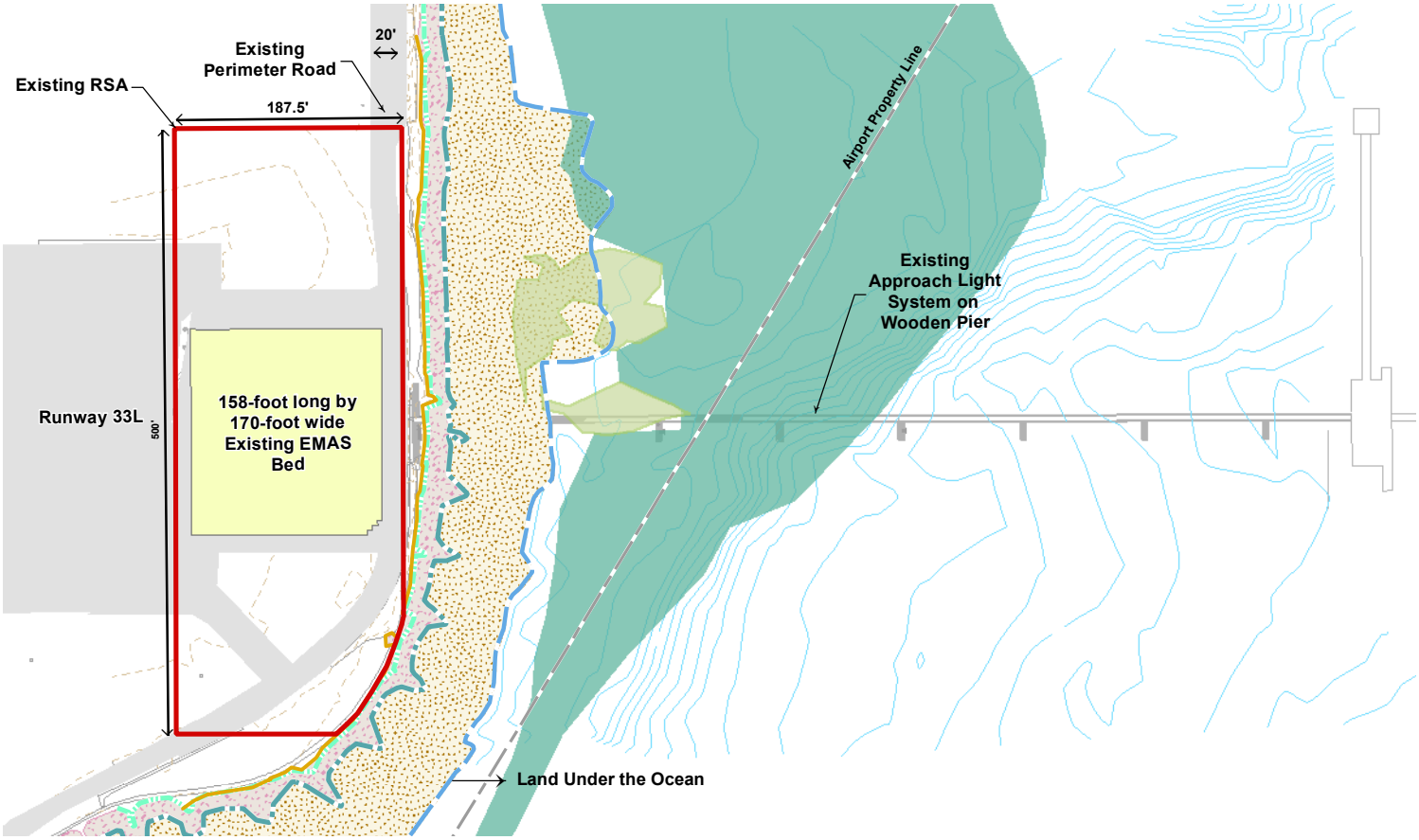
Runway	Heavy Jets A[1]	Heavy Jets B[2]	Light Jets A[3]	Light Jets B[4]	Regional Jets[5]	Turboprops (Non-jets)[6]	Total Operations
Arrivals							
15R	0.89%	3.14%	4.44%	42.42%	30.10%	19.01%	100.00%
33L	1.39%	4.68%	5.69%	48.00%	30.30%	9.94%	100.00%
Total	2.28%	7.82%	10.13%	90.42%	60.40%	28.95%	
Departures							
15R	3.81%	7.33%	4.34%	29.15%	12.45%	42.92%	100.00%
33L	1.18%	3.70%	5.21%	48.15%	32.68%	9.08%	100.00%
Total	4.99%	11.03%	9.55%	77.30%	45.13%	52.00%	

Source: 2007 modeled operation data generated by HMMH for the Massachusetts Port Authority, *Boston-Logan International Airport 2007 Environmental Data Report*, September 2008.

1. Heavy Jets A= Boeing 747s, Airbus 340s, DC-8s.
2. Heavy Jets B = Boeing 767s, Boeing 777s, Airbus 300s, Airbus 310s, Airbus 330s, DC-10s, L1011s, Boeing/McDonnell Douglas MD11s.
3. Light Jets A = Boeing 717s, Boeing 727s, DC-9s, F100s, Boeing/McDonnell Douglas MD90s.
4. Light Jets B = Boeing 737s, Boeing 757s, Airbus 319s, Airbus 320s, Beech 146s, Boeing/McDonnell Douglas MD80s.
5. Regional Jet = Embraer 135, Embraer 145, Embraer 170, Embraer 190, Bombardier CRJ 2, Bombardier CRJ 7, Bombardier CRJ 9, Fairchild Dornier 328JET.
6. Corporate Jets and Turboprops = Beech King Air, Cessna 402.

RSAs are located at either end of Runway 15R-33L. Runways 15R and 33L are used for both arrivals and departures. The RSA for the Runway 15R end is 500 feet wide and 1,000 feet long beyond the runway end, meeting the FAA standard RSA dimensions for the runway's design aircraft. The Runway 33L RSA is intended to provide protection in the event that an aircraft arriving on Runway 15R fails to stop before the end of the paved runway surface or runway threshold (an overrun) or in the event that an aircraft arriving on Runway 33L lands short of the runway threshold (an undershoot). The existing RSA for the Runway 33L end (Figure 3-1) is 187.5 feet long and 500 feet wide. A 158-foot long and 170-foot wide EMAS bed was installed (within that area, and set back 13 feet from the runway threshold) in 2006 as an interim safety enhancement. As discussed in Section 2.3, the existing RSA for the Runway 33L end provides some protection for aircraft in the event of an overrun, but does not provide the level of protection required by FAA's Airport Design Advisory Circular.[35]

35 United States Department of Transportation, Federal Aviation Administration, *Advisory Circular (AC) 150/5300-13, Airport Design, Changes 1 through 13,* June 19, 2008.



\\mawatrev\09980.00\GIS\project\ENF-2009\Runway33L_ExistingRSA.mxd

0 150 Feet

Legend

- Existing RSA
- Existing EMAS Bed
- Coastal Bank
- Coastal Beach
- Mussel Bed
- Limit of Eelgrass
- Existing Contour
- Existing Bathymetric Contour
- Mean High Water (4.58')
- Mean Low Water (-4.51')
- Top of Coastal Bank
- Limit of Land Subject to Coastal Storm Flowage

massport

LOGAN AIRPORT RSA
Runway Safety Area Improvement Project

Logan RSA

Figure 3-1

Existing Runway 33L RSA

Source: Jacobs Edwards & Kelcey, Inc.
Childs Engineering Corps.
VHB Field Work - 2008

Runway 15R-33L is equipped with navigational aids (navaids). Navaids include visual or electronic devices, either airborne or on the ground, that provide guidance information or position data to aircraft using the runway. At the Runway 33L end these include:

- Instrument Landing System (ILS) including localizer and glide slope antenna;
- Very High Omni-Directional Range/ Distance Measuring Equipment (VOR/ DME);
- Medium intensity approach lighting system with runway alignment indicator lights (MALSR). A MALSR is an approach light system that extends 2,400 feet away from the runway threshold that is a required component of an ILS approach. The MALSR lights, spaced at 200-foot intervals, are located on a pile-supported timber pier that extends 2,400 feet into Boston Harbor; and
- A precision approach path indicator (PAPI). A PAPI is a visual guidance aid that provides pilots with visual approach slope guidance to the runway touch down area, which is 1,000 feet down the runway from the runway end.

A 20-foot wide airport perimeter road is located within the Runway 33L RSA. The perimeter road is used by airport maintenance vehicles, emergency vehicles such as firefighting trucks, State Police, Massport Operations, FAA, and construction vehicles. The perimeter road provides a vital link to key locations around the airfield and is necessary for airport operations and emergency access.

3.1.2 Runway Safety Area Enhancement Alternatives for Runway 33L

This section describes the process undertaken by Massport and FAA to identify reasonable alternatives for enhancing the RSA at the end of Runway 33L. Section 3.1.2.1 presents the design criteria used to develop alternatives for RSA enhancement, and Sections 3.1.2.3 and 3.1.2.4 contains a description of the alternatives considered and identifies the alternatives to be carried forward for detailed analysis in the Draft EA/ EIR. The alternatives were analyzed by applying a multi-tiered screening process presented in Section 3.1.2.2.

3.1.2.1 Design Criteria

The alternatives considered in this ENF for enhancing the Runway 33L RSA were developed to incorporate each of the design criteria described below:

- **Provide overrun and undershoot protection for aircraft consistent with FAA design criteria.** The alternative must provide protection in the event that an aircraft arriving on Runway 15R fails to stop before the Runway 33L threshold (overrun) or if an aircraft arriving on Runway 33L lands short of the runway threshold (undershoot). The level of protection provided must be consistent with the FAA design criteria of 1,000 feet (or equivalent with an EMAS bed) for an overrun and 600 feet for an undershoot (see Section 2.2 of this narrative).

- **Provide protection for the runway's design aircraft.** The Boeing 747-400, with a Maximum Takeoff Weight (MTOW) of 870,000 pounds and Maximum Landing Weight (MLW) of 630,000 pounds, is the design aircraft for Runway 33L.[36]
- **Retain navaids and perimeter road.** The alternative must retain or relocate existing navaids and the perimeter road.

No alternatives are being brought forward for further environmental review and consideration that affect normal runway operations, runway capacity, or types of aircraft that can use the runways.

3.1.2.2 Alternatives Screening Process and Screening Criteria

A multi-tiered screening process was established by Massport and FAA to identify reasonable alternatives for enhancing the RSA at the end of Runway 33L. The screening process and screening criteria are described below and shown in Figure 3-2.

- **Screening Level 1 – Candidate Alternatives.** Several initial or candidate alternatives were developed to meet the current FAA RSA design criteria described in Section 3.1.2.1 of this narrative. Runway utility and capacity were used as screening criteria to assess whether a candidate alternative should be carried forward for further analysis in the next stage of the screening process or eliminated from further consideration. Each candidate alternative was assessed based on whether it maintained normal runway operations, maintained the utility and capacity of Runway 15R-33L, and maintained the types of aircraft that can currently use the runway.
- **Screening Level 2 – Preliminary Alternatives.** Based on the results of the first level of the screening process, preliminary alternatives were developed, all of which maintained normal runway operations, the utility and capacity of Runway 15R-33L, and the types of aircraft that can currently use the runway. Potential environmental impacts and feasibility (constructability and cost) were used as screening criteria to assess whether a preliminary alternative should be carried forward for further analysis in the Draft EA/ EIR or eliminated from further consideration. The potential environmental impact of a preliminary alternative was considered first, and then the constructability and cost of the preliminary alternative was considered. The FAA has a maximum feasible cost guideline of $25 million for safety area improvements using EMAS with a 70-knot arrestment speed for the design aircraft and 600 foot undershoot protection.[37] However, in the *Runway Safety Area Determination: Runway 15R-33L General Edward Lawrence Logan International Airport East Boston, Massachusetts*, dated January 30, 2009 (provided in Appendix A), the FAA determined that with 2 million passengers on board jet operations involving the Runway 33L RSA, it was justified to exceed the $25 million threshold.[38]

The screening process for the Runway 33L RSA enhancement alternatives is shown in Figure 3-2.

36 Edwards and Kelcey, Inc., Massport Runway 15R-33L Safety Area Study Technical Report, December 2005, p. 03-1.
37 Federal Aviation Administration, *Runway Safety Area Determination: Runway 15R-33L General Edward Lawrence Logan International Airport East Boston, Massachusetts*, January 30, 2009, p. 6.
38 *ibid*, p. 6.

Screening Level 1
Screening Criteria: Runway Utility and Capacity

Candidate Alternatives

Candidate Alternative 1	Candidate Alternative 2	Candidate Alternative 3	Candidate Alternative 4
Shorten Runway 15R-33L	Shift runway thresholds	Shift runway thresholds in combination with RSA enhancement	Full 1,000 ft long RSA
Eliminated	***Eliminated***	***Eliminated***	***Proceeds to Screening Level 2***

Screening Level 2
Screening Criteria: Environmental Impacts and Feasibility (Constructability and Cost)

Preliminary Alternatives - RSA Enhancement Alternatives

Preliminary Alternative	Preliminary Alternative 2	Preliminary Alternative 3	Preliminary Alternative 4
Full 1,000 ft long RSA (rip-rap, bulkhead, pile-supported deck)	600 ft long x 500 ft wide RSA with EMAS (rip-rap, bulkhead, pile-supported deck)	600 ft long x 400 ft wide RSA with EMAS (pile-supported deck)	600 ft long x 300 ft wide RSA with EMAS (pile-supported deck)
Eliminated	***Eliminated***	***Eliminated***	***Retained for Evaluation in Draft EA/EIR***

massport LOGAN AIRPORT RSA Runway Safety Area Improvements Project

Logan RSA

Figure 3-2

Runway 33L
Alternatives Screening Process

3.1.2.3 Candidate Alternatives Considered

This section describes the candidate alternatives considered by Massport and FAA for enhancing the Runway 33L RSA, and the results of the first level of the screening process. The following alternatives were considered:

- Runway 33L Candidate Alternative 1 – Shorten Runway 15R-33L
- Runway 33L Candidate Alternative 2 – Shift Runway Thresholds
- Runway 33L Candidate Alternative 3 – Shift Runway Thresholds in Combination with RSA Enhancement
- Runway 33L Candidate Alternative 4 - Full 1,000-Foot Long RSA

Runway 33L Candidate Alternative 1 - Shorten Runway 15R-33L

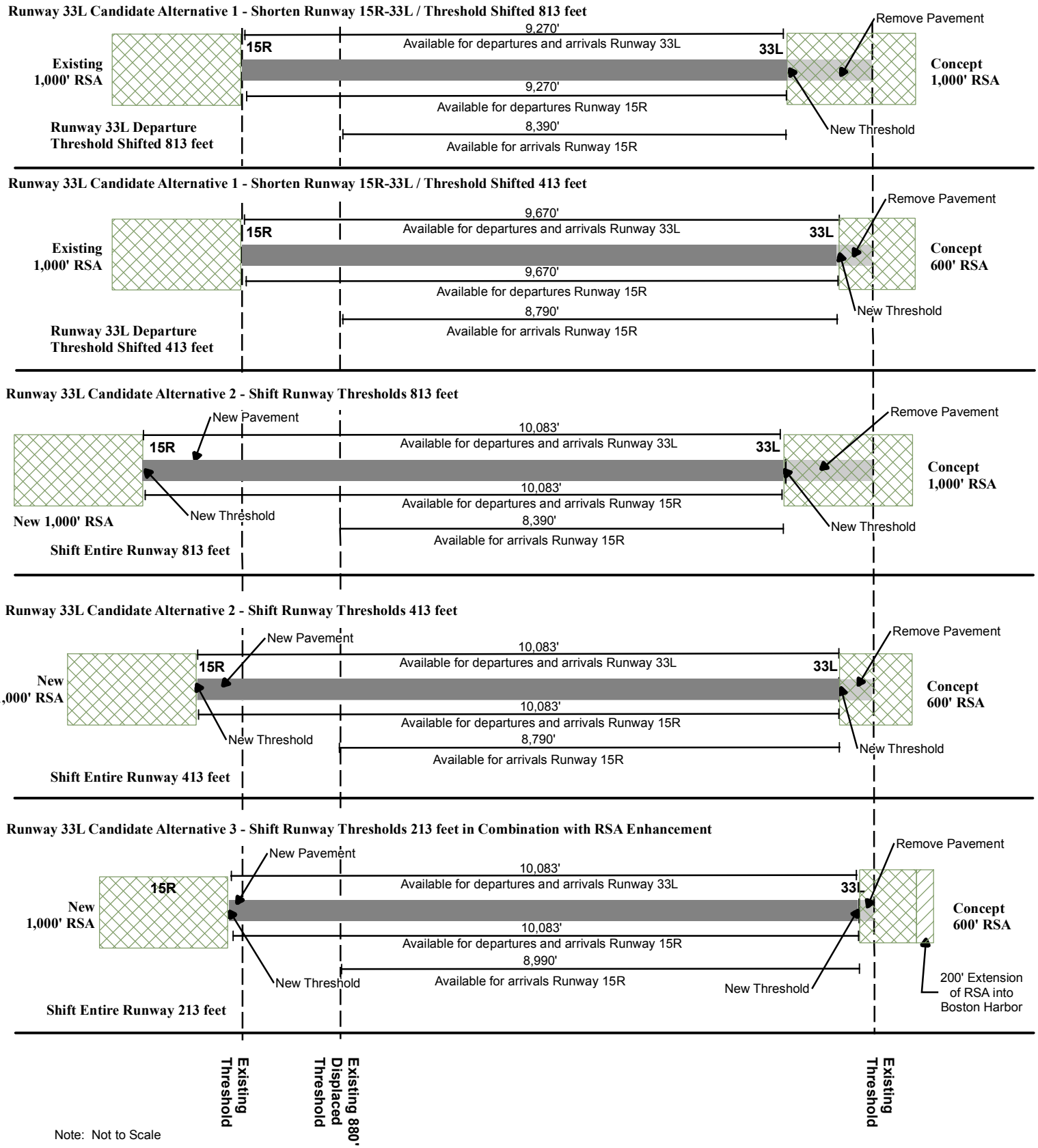
Description of Alternative

This alternative would relocate the Runway 33L threshold to the northwest (Figure 3-3). Moving the runway threshold would require extensive modifications to the airfield navigational aid (navaid) systems, relocation of runway lighting and signs, and relocation of the end taxiway. FAA and Massport considered two options, shifting the departure threshold 813 feet or 413 feet to the northwest (Figure 3-3). Shifting the departure threshold 813 feet to the northwest would create a 1,000-foot long RSA for Runway 33L capable of providing overrun and undershoot protection for aircraft, and would fully comply with the current design criteria in the FAA's Airport Design Advisory Circular for RSAs.[39] Under this alternative, the departure and arrival distances on Runway 33L, and the departure distance on Runway 15R, would be reduced from 10,083 feet to 9,270 feet. It would also reduce the arrival distance on Runway 15R from 9,203 feet to 8,390 feet.[40] Shifting the departure threshold 413 feet to the northwest would create a 600-foot long RSA with EMAS for Runway 33L capable of providing overrun and undershoot protection for aircraft, and would fully comply with the current design criteria in the FAA's Airport Design Advisory Circular for RSAs.[41] Under this alternative, the departure and arrival distances on Runway 33L, and the departure distance on Runway 15R, would be reduced from 10,083 feet to 9,670 feet. It would also reduce the arrival distance on Runway 15R from 9,203 feet to 8,790 feet.

Results of Alternatives Screening

This alternative would irretrievably sacrifice 813 feet or 413 feet of useable runway length from both Runway 15R-33L.[42] Reducing the length of Runway 15R-33L would reduce the current and future utility and capacity of the runway. As the longest runway at Logan Airport, Runway 15R-33L is essential to Logan Airport's role as the long-haul international gateway for New England, and any reduction in utility and capacity of the runway would have an adverse impact on Logan Airport operations. In March 2005, the FAA submitted its *"Report to Congress on the Impact to Airports through the Implementation of Declared Distances and/or*

39 United States Department of Transportation, Federal Aviation Administration, *Advisory Circular (AC) 150/5300-13, Airport Design, Changes 1 through 13,* June 19, 2008.
40 SH&E, Inc, Edwards and Kelcey, Inc., Flight Transportation Associates, Inc., *Massport Runway 15R-33L Safety Area Study*, December 2005,
41 United States Department of Transportation, Federal Aviation Administration, *Advisory Circular (AC) 150/5300-13, Airport Design, Changes 1 through 13,* June 19, 2008.
42 SH&E, Inc, Edwards and Kelcey, Inc., Flight Transportation Associates, Inc., *Massport Runway 15R-33L Safety Area Study*, December 2005.



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LOGAN AIRPORT RSA
Runway Safety Area Improvement Project

Logan RSA

Figure 3-3

Runway 33L Candidate Alternatives 1, 2, and 3

Data Sources:
Jacobs Edwards & Kelcey, Inc.

Reduction in the Length of Runways to Comply with FAA Runway Safety Area Standards." The report stated that "It is not FAA's policy to require an owner or operator" [of an airport] to "reduce the length of the runway... if there is an operational impact to the airport. Operational impact is defined as anything that would reduce the passenger or cargo capacity or size of aircraft operating at the airport." In addition, FAA AC 150/ 5220-22A, Section 4, paragraph three, states that, "The FAA does not require an airport sponsor to reduce the length of a runway…to meet RSA standards if there is an operational impact to the airport." Furthermore, in the *Runway Safety Area Determination: Runway 15R-33L General Edward Lawrence Logan International Airport East Boston, Massachusetts*, dated January 30, 2009 (provided in Appendix A), the FAA determined that this alternative would be "unacceptable due to loss of critical runway length…." and went on to state that Runway 15R-33L is the "only long runway available in northwest wind conditions and is designated the preferential runway for night operations."[43]

Under this alternative, Runway 15R-33L would be shortened. Given that Runway 15R-33L is Logan Airport's longest runway, is used by the largest category of jet aircraft, and is used for landings during emergencies, Massport's position is at that shortening Runway 15R-33L will not enhance overall safety and may in fact degrade safety by providing the pilot less usable runway. Massport's position is that an alternative must enhance overall safety. An alternative that meets the RSA safety goal must not do so by reducing the safety margin elsewhere.

Conclusion

Massport and FAA eliminated this alternative because it would irretrievably sacrifice 813 feet or 413 feet of useable runway length from both Runways 15R and 33L, thereby creating a significant adverse operational impact that would reduce current and future runway utility and capacity.

Runway 33L Candidate Alternative 2 - Shift Runway Thresholds

Description of Alternative

This alternative would require shifting the entire runway to the northwest. FAA and Massport considered two options, shifting the entire runway 813 feet or 413 feet to the northwest (Figure 3-3). The first option would require shifting the entire runway 813 feet northwest and installing a 1,000-foot long and 500-foot wide RSA at the end of Runway 33L. The second would require shifting the entire runway 413 feet to the northwest to create a 600-foot long and 500-foot wide RSA with EMAS for Runway 33L capable of providing overrun and undershoot protection for aircraft. Both options would fully comply with the current design criteria in the FAA's Airport Design Advisory Circular for RSAs.[44] This would require the relocation of navaids for both runways, the relocation of runway lights and signs, and the relocation of both end taxiways. This would maintain the full 10,083 feet of runway length for arrivals and departures on Runway 33L and for departures on Runway 15R. Due

43 Federal Aviation Administration, *Runway Safety Area Determination: Runway 15R-33L General Edward Lawrence Logan International Airport East Boston, Massachusetts,* January 30, 2009, p. 4.

44 United States Department of Transportation, Federal Aviation Administration, *Advisory Circular (AC) 150/5300-13, Airport Design, Changes 1 through 13,* June 19, 2008.

to the existing displaced threshold for arrivals on Runway 15R, the arrival distance would either be shortened by 813 feet or 413 feet, depending on the option, to a distance of 8,390 or 8,790 feet, respectively.[45] In addition, because Runway 33L departures would be starting their takeoff either 813 or 413 feet closer to the obstacles in East Boston, additional weight penalties would be applied to all aircraft, resulting in reduced payloads.

This alternative would necessitate the acquisition of businesses and residences in East Boston in order to shift the runway, the demolition of existing airport maintenance and tenant facilities, construction of 813 feet or 413 feet of new paved runway surface at the Runway 15R end, and removal of the equivalent length of runway at the Runway 33L end in order to provide a cleared and graded 1,000-foot long RSA or a 600-foot long RSA with EMAS.[46] The existing navaids for Runway 33L would be relocated closer to the new runway threshold. The perimeter road would remain in the same location.

Results of Alternatives Screening

This alternative would have a similar effect as the Runway 33L Alternative 1, irretrievably sacrificing 813 or 413 feet of useable runway length for arrivals on Runway 15R, which would reduce current and future runway utility and capacity.[47] Massport and the FAA determined that this alternative would be unacceptable for the following reasons:[48]

- Shifting the runway to the northwest would bring airport activities closer to the adjacent East Boston neighborhood.
- The Runway 33L glide slope indicator would need to be relocated into the protected area of Runway 27, and while objects fixed by function are allowed within the Runway Safety Area, the FAA strives to limit these objects.
- There would be incompatible land uses within the Runway 15R Runway Protection Zone (RPZ).
- There would be increased penetrations to the Runway 15R approach surface and the Runway 33L departure surface, resulting in significant weight penalties and limits on runway usage during all-weather operations.

Under this alternative, the arrival distance on Runway 15R would be shortened. Given that Runway 15R-33L is Logan Airport's longest runway, is used by the largest category of jet aircraft, and is used for landings during emergencies, Massport's position is at that shortening Runway 15R-33L would not enhance overall safety and may in fact degrade safety by providing the pilot less usable runway. Massport's position is that an alternative must enhance overall safety. An alternative that meets the RSA safety goal must not do so by reducing the safety margin elsewhere.

45 SH&E, Inc, Edwards and Kelcey, Inc., Flight Transportation Associates, Inc., *Massport Runway 15R-33L Safety Area Study*, December 2005.
46 SH&E, Inc, Edwards and Kelcey, Inc., Flight Transportation Associates, Inc., *Massport Runway 15R-33L Safety Area Study*, December 2005.
47 SH&E, Inc, Edwards and Kelcey, Inc., Flight Transportation Associates, Inc., *Massport Runway 15R-33L Safety Area Study*, December 2005.
48 Federal Aviation Administration, *Runway Safety Area Determination: Runway 15R-33L General Edward Lawrence Logan International Airport East Boston, Massachusetts*, January 30, 2009, p. 5.

Conclusion

Massport and FAA eliminated this alternative because it would irretrievably sacrifice 813 or 413 feet of useable runway length from Runway 15R, and would result in increased weight penalties for Runway 33L departures, thereby reducing current and future runway utility and capacity.

Runway 33L Candidate Alternative 3 - Shift Runway Thresholds in Combination with RSA Enhancement

Description of Alternative

This alternative would require shifting the entire runway 213 feet to the northwest. The entire runway would be shifted 213 feet northwest to create a 600-foot long and 500-foot wide RSA with EMAS for Runway 33L capable of providing overrun and undershoot protection for aircraft (Figure 3-3). This alternative would fully comply with the current design criteria in the FAA's Airport Design Advisory Circular for RSAs.[49] This alternative would require the relocation of navaids for both runways, the relocation of runway lights and signs, the relocation of both end taxiways, and extension of the RSA approximately 200 feet into Boston Harbor. This would maintain the full 10,083 feet of runway length for arrivals and departures on Runway 33L and for departures on Runway 15R. Due to the existing displaced threshold for arrivals on Runway 15R, the arrival distance would be shortened by 213 feet to a distance of 8,990 feet. In addition, because Runway 33L departures would be starting their takeoff 213 feet closer to the obstacles in East Boston, additional weight penalties would be applied to all aircraft, resulting in reduced payloads.

This alternative would introduce non-compatible uses within the Runway 15R RPZ (mainly existing businesses and residences in East Boston) in order to shift the runway, the demolition of existing airport maintenance and tenant facilities, construction of 213 feet of new paved runway surface at the Runway 15R end, and removal of the equivalent length of runway at the Runway 33L end in order to provide a 600-foot long RSA with EMAS.[50] The existing navaids for Runway 33L would be relocated closer to the new runway threshold. The perimeter road would remain in the same location.

Results of Alternatives Screening

This alternative would have a similar effect as the Runway 33L Alternative 2, irretrievably sacrificing 213 feet of useable runway length for arrivals on Runway 15R, which would reduce current and future runway utility and capacity.[51] Massport and the FAA determined that this alternative would be unacceptable for the following reasons:[52]

- Shifting the runway to the northwest would bring airport activities closer to the adjacent East Boston neighborhood.

49 United States Department of Transportation, Federal Aviation Administration, *Advisory Circular (AC) 150/5300-13, Airport Design, Changes 1 through 13,* June 19, 2008.
50 SH&E, Inc, Edwards and Kelcey, Inc., Flight Transportation Associates, Inc., *Massport Runway 15R-33L Safety Area Study*, December 2005.
51 SH&E, Inc, Edwards and Kelcey, Inc., Flight Transportation Associates, Inc., *Massport Runway 15R-33L Safety Area Study*, December 2005.
52 Federal Aviation Administration, *Runway Safety Area Determination: Runway 15R-33L General Edward Lawrence Logan International Airport East Boston, Massachusetts*, January 30, 2009, p. 5.

- There would be additional incompatible land uses within the Runway 15R RPZ.
- There would be increased penetrations to the Runway 15R approach surface and the Runway 33L departure surface, resulting in significant weight penalties and limits on runway usage during all-weather operations.

In addition, extension of the RSA into Boston Harbor would have some of the same impacts to environmental resources and coastal processes as described for the preliminary alternatives described in Section 3.1.2.4 of this narrative.

Under this alternative, the arrival distance on Runway 15R would be shortened. Given that Runway 15R-33L is Logan Airport's longest runway, is used by the largest category of jet aircraft, and is used for landings during emergencies, Massport's position is at that shortening Runway 15R-33L would not enhance overall safety and may in fact degrade safety by providing the pilot less usable runway. Massport's position is that an alternative must enhance overall safety. An alternative that meets the RSA safety goal must not do so by reducing the safety margin elsewhere.

Conclusion

Massport and FAA eliminated this alternative because it would irretrievably sacrifice 213 feet of useable runway length from Runway 15R, and would result in increased weight penalties for Runway 33L departures, thereby reducing current and future runway utility and capacity.

Runway 33L Candidate Alternative 4 – Full 1,000-Foot Long RSA

Description of Alternative

This alternative would extend the length of the existing RSA from 187.5 feet to 1,000 feet, of which approximately 813 feet would extend into Boston Harbor.[53] The width of the RSA would be maintained at 500 feet. The 1,000-foot long by 500-foot wide RSA would fully comply with the design criteria in the FAA's Airport Design Advisory Circular for RSAs without an EMAS bed.[54] The existing 158-foot long and 170-foot wide EMAS bed would be retained. As part of this alternative, the existing offset localizer would be repositioned to the end of the RSA. The existing 20-foot wide airport perimeter road, which is currently located within the RSA at the end of the EMAS bed, would be retained. Taking into account the extended RSA, perimeter road, and repositioned localizer, Candidate Alternative 4 would have an overall estimated length of 1,060 feet and a width of 500 feet.

53 SH&E, Inc, Edwards and Kelcey, Inc., Flight Transportation Associates, Inc., *Massport Runway 15R-33L Safety Area Study*, December 2005,
54 United States Department of Transportation, Federal Aviation Administration, *Advisory Circular (AC) 150/5300-13, Airport Design, Changes 1 through 13,* June 19, 2008.

Results of Alternatives Screening

This alternative would maintain the length of Runway 15R-33L, and would not have any impact on current and future runway utility and capacity. It would maintain normal runway operations, maintain the utility and capacity of Runway 15R-33L, and maintain the types of aircraft that can currently use the runway.

Conclusion

Massport and FAA retained this alternative on the basis that it would not have any impact on the utility and capacity of Runway 15R-33L. This alternative was carried forward for further analysis in the second level of the screening process.

3.1.2.4 Preliminary Alternatives Considered

Based on the results of the first level of the screening process, a series of preliminary alternatives were developed. All of the preliminary alternatives require enhancement of the RSA and maintain the utility and capacity of Runway 15R-33L. This section describes the preliminary alternatives considered by Massport and FAA for enhancing the Runway 33L RSA, and describes the outcome of the second level of the screening process. As described in Chapter 2 of this narrative, the current design guidelines allow for a standard RSA that is 1,000 feet long and 500 feet wide at each runway end, where the RSA is cleared and graded with no potentially hazardous ruts, humps, depressions, or other surface variations; or at airports where space is limited and land is not available to accommodate the standard 1,000-foot long by 500-foot wide RSAs, the FAA has approved the use of EMAS to provide overrun protection. The Preliminary Alternatives consider both standard RSAs and RSAs with EMAS.

The following three preliminary alternatives were developed:

- Runway 33L Preliminary Alternative 1 - Full 1,000-Foot Long RSA
- Runway 33L Preliminary Alternative 2 – 600-Foot Long and 500-Foot Wide RSA with EMAS
- Runway 33L Preliminary Alternative 3 – 600-Foot Long and 400-Foot Wide RSA with EMAS on Pile-Supported Deck

Screening criteria considered include environmental resource impacts, changes to coastal processes, constructability, and cost.

Runway 33L Preliminary Alternative 1 – Full 1,000-Foot Long RSA

Description of Alternative

This alternative would extend the length of the existing RSA from 187.5 feet to 1,000 feet, of which approximately 813 feet would extend into Boston Harbor.[55] The width of the RSA would be maintained at

55 SH&E, Inc, Edwards and Kelcey, Inc., Flight Transportation Associates, Inc., *Massport Runway 15R-33L Safety Area Study*, December 2005,

500 feet. The 1,000-foot long by 500-foot wide RSA would fully comply with the design criteria in the FAA's Airport Design Advisory Circular for RSAs without an EMAS bed.[56] The existing 158-foot long and 170-foot wide EMAS bed would be retained. As part of this alternative, the existing offset localizer would be repositioned to the end of the RSA. The existing 20-foot wide airport perimeter road, which is currently located within the RSA at the end of the EMAS bed, would be retained. Taking into account the extended RSA, perimeter road, and repositioned localizer, Preliminary Alternative 1 would have an overall estimated length of 1,060 feet and a width of 500 feet.

For this alternative, the following three design options were considered:

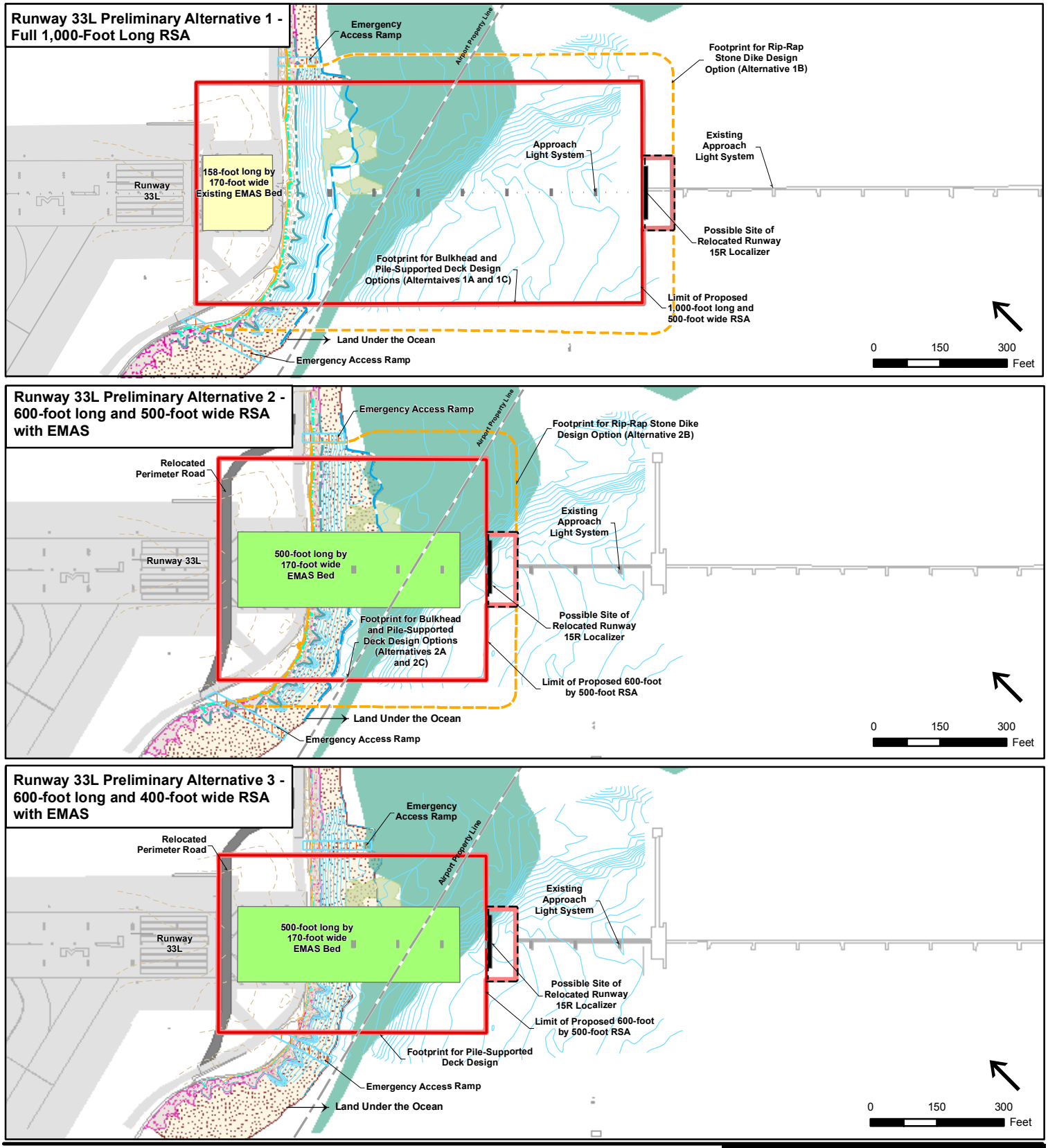
- Runway 33L Preliminary Alternative 1A – RSA on Solid Fill with a Sheet Steel Bulkhead
- Runway 33L Preliminary Alternative 1B – RSA on Solid Fill with a Rip-Rap Stone Dike
- Runway 33L Preliminary Alternative 1C – RSA on a Pile-Supported Deck

Runway 33L Preliminary Alternative 1A would be constructed by installing a sheet steel bulkhead around the perimeter of the RSA and repositioned localizer. Fill would be placed within the bulkhead, and turf would be installed on top of the fill. Runway 33L Preliminary Alternative 1B would be constructed by installing a rip-rap stone dike around the perimeter of the RSA and repositioned localizer. Fill would be placed within the stone dike, and turf would be installed on top of the fill. Runway 33L Preliminary Alternative 1C would be constructed by installing a pile-supported deck to support the extended RSA and repositioned localizer. Figure 3-4 shows the extent of the Runway 33L Preliminary Alternatives 1A, 1B, and 1C. For the purposes of this assessment, consideration was given to Preliminary Alternative 1B which has the potential for greatest environmental impact, because placing fill within the rip-rap stone dike would cause it to extend the greatest distance into Boston Harbor.

An emergency access ramp would be installed on both sides of the RSA to provide first responders with access points between the water and the airfield. The emergency access ramps would consist of a 20-foot wide rip-rap rock stone slope (30 percent grade) with a gravel surface. Either ladders or concrete steps would be provided on the sides and end of the RSA to allow passengers and aircraft crew to more easily climb out of the water in the event an aircraft overruns the end of the runway and RSA, and enters the water.

As part of the Logan Airside Improvements Planning Project,[57] the FAA proposed the improvement of approach minimums for Runways 15R and 33L. Those changes to the approach minimums were approved by the FAA in its Record of Decision for the Airside Project dated August 2, 2002. Implementation of the new approach minimums for Runway 33L requires modification of existing airfield navigational equipment, including the approach lighting system on the Runway 33L wooden light pier. Implementation of the new

56 United States Department of Transportation, Federal Aviation Administration, *Advisory Circular (AC) 150/5300-13, Airport Design, Changes 1 through 13,* June 19, 2008.
57 Federal Aviation Administration, *Logan Airside Improvements Planning Project Final Environmental Impact Statement, Boston-Logan International Airport*, June 2002.


Runway 33L Preliminary Alternative 1 - Full 1,000-Foot Long RSA
Emergency Access Ramp
Airport Property Line
Footprint for Rip-Rap Stone Dike Design Option (Alternative 1B)
Existing Approach Light System
Approach Light System
158-foot long by 170-foot wide Existing EMAS Bed
Runway 33L
Possible Site of Relocated Runway 15R Localizer
Footprint for Bulkhead and Pile-Supported Deck Design Options (Alterntaives 1A and 1C)
Limit of Proposed 1,000-foot long and 500-foot wide RSA
Land Under the Ocean
Emergency Access Ramp
0
150
300
Feet
Runway 33L Preliminary Alternative 2 - 600-foot long and 500-foot wide RSA with EMAS
Emergency Access Ramp
Airport Property Line
Footprint for Rip-Rap Stone Dike Design Option (Alternative 2B)
Relocated Perimeter Road
Existing Approach Light System
Runway 33L
500-foot long by 170-foot wide EMAS Bed
Possible Site of Relocated Runway 15R Localizer
Footprint for Bulkhead and Pile-Supported Deck Design Options (Alternatives 2A and 2C)
Limit of Proposed 600-foot by 500-foot RSA
Land Under the Ocean
Emergency Access Ramp
0
150
300
Feet
Runway 33L Preliminary Alternative 3 - 600-foot long and 400-foot wide RSA with EMAS
Emergency Access Ramp
Relocated Perimeter Road
Airport Property Line
Existing Approach Light System
Runway 33L
500-foot long by 170-foot wide EMAS Bed
Possible Site of Relocated Runway 15R Localizer
Limit of Proposed 600-foot by 500-foot RSA
Footprint for Pile-Supported Deck Design
Emergency Access Ramp
Land Under the Ocean
0
150
300
Feet

Legend

- Existing EMAS Bed
- New EMAS Bed
- Limit of Rip-Rap Stone Dike
- Footprint for Bulkhead or Pile-Supported Deck
- RSA Footprint
- Emergency Ramps
- Pile Supported Deck for Localizer
- Existing Bathymetric Contour
- Existing Contour
- Limit of Land Subject to Coastal Storm Flowage
- Mean High Water (4.58')
- Mean Low Water (-4.51')
- Top of Coastal Bank
- Coastal Bank
- Coastal Beach
- Mussel Bed
- Limit of Eel Grass

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LOGAN AIRPORT RSA
Runway Safety Area Improvements Project

Logan RSA

Figure 3-4

Runway 33L Preliminary Alternative 1, 2 and 3

Source: Jacobs Edwards & Kelcey, Inc.
Childs Engineering Corps.
Massport - Bathymetric Contours

approach minimums for Runway 15R (at the Runway 33L end) requires repositioning of the existing offset localizer. Because design of the Runway 33L RSA enhancements would require modifications to the existing approach lighting system's pier, the potential environmental impacts of any new navigational equipment modifications, including the localizer repositioning, will be addressed in the Draft EA/ EIR as part of the cumulative assessment of the RSA enhancements at this location. As part of the planning for the RSA improvements at this location, Massport and FAA will also evaluate opportunities to reconfigure the Taxiway C/ runway connection to minimize future back-taxi needs. The potential environmental impacts of reconfiguring Taxiway C will also be addressed in the Draft EA/ EIR.

Results of Alternatives Screening

The Runway 33L Preliminary Alternative 1 would have the greatest potential impact to environmental resources of all the preliminary alternatives considered.

Environmental Resource Impacts

Coastal Bank would be eliminated along the width of the structure, and Coastal Beach, Land Under the Ocean, Land Containing Shellfish, and Submerged Aquatic Vegetation (eelgrass) would be eliminated beneath the footprint of the structure. The impact to environmental resources varies depending on the design option, but as a worst case the design option which would require placement of fill within a rip-rap stone dike in Boston Harbor (Preliminary Alternative 1B) would result in the loss of the following environmental resources:

- Coastal Bank – Approximately 715 linear feet
- Coastal Beach – Approximately 56,020 square feet
- Land Under the Ocean – Approximately 481,380 square feet
- Land Containing Shellfish – Approximately 537,400 square feet
- Submerged Aquatic Vegetation (eelgrass) – Approximately 129,930 square feet

The Runway 33L Preliminary Alternative 1B would also result in greater changes to coastal processes of all the preliminary alternatives considered. Coastal processes include wave action, tidal circulation, erosion, and sedimentation. The filled structures would have greater impacts than the pile-supported deck structure. For example, the currents would flow around the filled structures, which would change the flow pattern and, assuming there is transport of sediment past the site currently, there would be some sedimentation near the intersection of the filled structures and the shoreline, and some erosion of the shoreline and harbor bottom.

Conclusion

Massport and FAA have eliminated Preliminary Alternative 1 from further analysis on the basis that it would have the greatest potential impact to environmental resources and would result in greater changes to coastal processes of all the preliminary alternatives considered. Because of the extent of environmental resource impacts and that other practicable alternatives with fewer impacts existed, further consideration of changes to coastal process and constructability were not considered.

Runway 33L Preliminary Alternative 2 – 600-Foot Long and 500-Foot Wide RSA with EMAS

Description of Alternative

This alternative would meet the FAA's design criteria by including an EMAS bed in the RSA. Preliminary Alternative 2 would extend the length of the existing RSA from 187.5 feet to 600 feet. The width of the RSA would be maintained at 500 feet. The existing 158-foot long and 170-foot wide EMAS bed (with 60 psi strength EMAS blocks) that is located in the existing RSA would be removed and replaced with a new EMAS bed. The new EMAS bed would be constructed of 80 psi strength EMAS blocks and would have a total length of 500 feet. The EMAS bed would begin 40 feet from the runway's threshold. As part of this alternative, the existing 20-foot wide airport perimeter road would be relocated between the runway's threshold and the EMAS bed (it is currently located at the end of the existing EMAS bed). The localizer would be repositioned to the end of the RSA and installed on a 60-foot long and 160-foot wide pile-supported deck. Taking into account the new EMAS bed and extended RSA, the relocated perimeter road, and repositioned localizer, Preliminary Alternative 2 would have an overall estimated length of 660 feet and a width of 500 feet, of which, approximately 470 feet would extend into Boston Harbor.

The 600-foot long by 500-foot wide RSA with 500-foot long EMAS bed would provide overrun and undershoot protection for the design aircraft (Boeing 747-400) and would fully comply with the current design criteria in the FAA's Airport Design Advisory Circular for RSAs.[58]

For this alternative, the following three foundation structures design options were considered:

- Runway 33L Preliminary Alternative 2A –RSA with EMAS on Solid Fill with a Sheet Steel Bulkhead
- Runway 33L Preliminary Alternative 2B –RSA with EMAS on Solid Fill with a Rip-Rap Stone Dike
- Runway 33L Preliminary Alternative 2C –RSA with EMAS on a Pile-Supported Deck

These alternatives would follow the same construction techniques as described for Runway 33L Preliminary Alternative 1. Figure 3-4 shows the extent of the Runway 33L Preliminary Alternatives 2A, 2B, and 2C.

An emergency access ramp would be installed on each side of the RSA and ladders or concrete steps would be provided on the sides and end of the RSA, as described for Runway 33L Preliminary Alternative 1.

As described for Runway 33L Preliminary Alternative 1, the localizer would be relocated and opportunities for reconfiguring the Taxiway C/ runway connection will be evaluated. The potential environmental impacts of installing any new navigational equipment and reconfiguring Taxiway C will be addressed in the Draft EA/ EIR as part of the cumulative assessment of the RSA enhancements at this location. As part of the planning for the

58 United States Department of Transportation, Federal Aviation Administration, *Advisory Circular (AC) 150/5300-13, Airport Design, Changes 1 through 13,* June 19, 2008.

RSA improvements at this location, Massport and FAA will also evaluate opportunities to reconfigure the Taxiway C/ runway connection to minimize future back-taxi needs.

Results of Alternatives Screening

Runway 33L Preliminary Alternative 2 would result in impacts to environmental resources similar to the impacts described for Runway 33L Preliminary Alternative 1, however, because the structure is shorter in length it would significantly reduce the impacts to some resources including Land Under the Ocean and eelgrass.

Environmental Resource Impacts

The potential impacts of Runway 33L Preliminary Alternative 2 to environmental resources include:

- Coastal Bank – Coastal Bank would be eliminated along the width of the structure for each of the three design options. Approximately 715 linear feet would be impacted.
- Coastal Beach – Coastal Beach would be eliminated beneath the footprint of the filled structures. Of the two design options for the filled structures, the bulkhead structure would impact the smallest area of Coastal Beach, impacting approximately 46,890 square feet. For the pile-supported structure, Coastal Beach would be eliminated only where pilings are installed, and therefore would have less impact than the filled structures. The pilings may also have indirect impacts, potentially resulting in a change in form and volume of the Coastal Beach in the area beneath the deck.
- Land Under the Ocean – Land Under the Ocean would be eliminated beneath the footprint of the filled structures. Of the two design options for the filled structures, the bulkhead structure would impact the smallest area of Land Under the Ocean, impacting approximately 154,050 square feet. For the pile-supported structure, Land Under the Ocean would only be eliminated where pilings are installed, and therefore would have less impact than the filled structures.
- Land Containing Shellfish – Land Containing Shellfish would be eliminated beneath the footprint of the filled structures. Of the two design options for the filled structures, the bulkhead structure would impact the smallest area of Land Containing Shellfish, impacting approximately 200,940 square feet. For the pile-supported deck, Land Containing Shellfish would be lost only where pilings are installed. There could also be a potential change in productivity of the area adjacent to the filled structures and beneath the deck due to a potential change in the distribution of sediment grain size (refer to the section below that describes changes in coastal processes). However, habitat for shellfish would continue to be available as filter feeders and detritivores would not likely be significantly affected. The surface of the filled structures and pilings beneath the high water mark would provide substrate for attached and mobile intertidal and subtidal invertebrates including mussels. The pilings would provide more substrate than the filled structures for attached and mobile intertidal and subtidal invertebrates.
- Submerged Aquatic Vegetation (eelgrass) - Eelgrass would be eliminated beneath the footprint of the filled structures. Of the two design options for the filled structures, the bulkhead structure would impact the

smallest area of eelgrass, impacting approximately 87,450 square feet of eelgrass. There would also be a shading effect on eelgrass in some areas adjacent to the filled structures based on the position of the sun, which would have indirect impacts, potentially causing decreased density and fragmentation of eelgrass beds in these areas. In addition, increased sedimentation on the side of the filled structures near the shoreline (refer to the section below that describes changes in coastal processes) could cover eelgrass beds in this area. For the pile-supported deck, eelgrass would only be eliminated where pilings are installed. However, a large area beneath the pile-supported structure would be fully blocked from sunlight and therefore would not be able to sustain eelgrass beds, which require light penetration to support photosynthesis. Eelgrass would still be able to grow in areas beneath the outer edge of the deck that are exposed to sunlight for part of the day. The slight increase in sedimentation that may occur beneath the deck (refer to the section below that describes changes in coastal processes) could potentially cover small areas of eelgrass beds. The pile-supported deck structure would result in less eelgrass loss than the filled structures.

Changes in Coastal Processes

The Runway 33L Preliminary Alternative 2 would also result in changes to coastal processes. Waves at the site of the proposed Runway 33 L RSA enhancement are generally from the southeast and therefore the site is fully exposed to these waves. The waves, however, are typically locally generated and not large. Incident waves would reflect off, and travel away from, the filled structures, whereas, waves would generally move unimpeded under the pile-supported structure. Currents would flow around the filled structures which would change the flow pattern. However, the influence of the structures would be localized, probably within a distance of the scale of the structure (400 to 500 feet). There would likely be a reduction in flow in the area near the intersection of the shoreline and the filled structures, and an increase in flow at the seaward corners of the structures. Compared to the filled structures, the pile-supported structure would have little to no impact on tidal circulation and flow. Currents would generally move unimpeded under the pile-supported structure with some reduction in speed due to the presence of the piles. Assuming there is transport of sediment past the site currently, there would be some sedimentation near the intersection of the filled structures and the shoreline. Unless the structures and shoreline are suitably protected with rip-rap, there would be some erosion of the shoreline and harbor bottom. Compared to the filled structures, the pile-supported structure would have little to no impact on erosion and sedimentation of the harbor bottom and adjacent shoreline. Sedimentation may increase slightly beneath the pile-supported structure due to the slight reduction in speed of the currents due to the presence of the piles. A small amount of erosion of the harbor bottom may occur around the piles.

Based on the findings described above, Massport and FAA determined that of the three design options considered, Runway 33L Alternative 2C – 600-Foot Long and 500-Foot Wide RSA with EMAS on a Pile-Supported Deck would have the least environmental impact and that Runway 33L Preliminary Alternative 2B – 600-Foot Long and 500-Foot Wide RSA on Solid Fill with a Rip-Rap Stone Dike would have the greatest impact. Massport and FAA eliminated Runway 33L Preliminary Alternative 2B – 600-Foot Long and 500-Foot Wide RSA on Solid Fill with a Rip-Rap Stone Dike from further analysis on the basis that it would have the greatest potential impact to environmental resources of the three design options.

Constructability and Cost

Massport and FAA proceeded to examine the feasibility (constructability and cost) of Runway 33L Preliminary Alternative 2A – 600-Foot Long and 500-Foot Wide RSA with EMAS on Solid Fill with a Sheet Steel Bulkhead and Runway 33L Preliminary Alternative 2C – 600-Foot Long and 500-Foot Wide RSA with EMAS on a Pile-Supported Deck. It was determined that the bulkhead design option has the following constructability issues which would make this option difficult and costly to build and maintain:

- Temporary coffer dams would need to be installed to enable excavation of material and construction of the bulkhead, increasing the cost of construction and the potential environmental impact of construction. The coffer dams would extend approximately 30 feet on either side of the proposed bulkhead and would consist of a major steel sheet pile and bracing system.
- Dredging would be required inside the bulkhead down to approximately -13 feet from the existing mud line in order to remove a layer of unsuitable material. Dredging would be required because of the presence of very soft silts and fine sands below the mud line that are susceptible to earthquake liquefaction. If these materials were left in place and earthquake liquefaction was to occur, the bulkhead structure would be at risk of excessive settlements, deformation of tie rods, loss of passive soil resistance in the toe of the sheet pile wall, and loss of passive soil resistance of the anchor wall.[59] Dredging could be accomplished by mechanical or hydraulic methods. The latter method has the advantage of minimizing dewatering, handling, transportation and cofferdam bracing costs, but would require use of the airport property to set up belt drying equipment and/ or a transfer station (approximately 200 feet by 200 feet with height clearance of +/ - 20 feet) remote from the runway location. In addition to the material removed by dredging down to -13 feet, approximately 70,000 cubic yards of material down to an elevation of -45 feet would need to be removed and replaced with crushed stone in areas adjacent to the sheet pile bulkhead in order to properly stabilize the bulkhead.[60]
- Clays beneath the bulkhead would consolidate approximately 2.7 feet over the course of six years. This would necessitate removal of the EMAS bed and on-center localizer etc, backfilling to bring the surface back up to the design elevation, and then re-installation of the EMAS bed and on-center localizer several times over the 6-year period.

Massport and FAA estimate that the Runway 33L Preliminary Alternative 2A – RSA with EMAS on Solid Fill with a Sheet Steel Bulkhead would cost approximately $99 million to construct, which includes the cost of permitting, design, and mitigation. The cost estimate does not include the cost of the additional work required to maintain the surface at the design elevation. It was determined that the pile-supported structure would not have the constructability issues of the bulkhead design option that would make it difficult to build and maintain, and it would cost approximately $93 million to construct.

59 Childs Engineering, Geotechnical Investigation, October 9, 2008, p. 7.
60 Childs Engineering, Geotechnical Investigation, October 9, 2008, p. 1.

The FAA has a maximum feasible cost threshold of $25 million for safety area improvements using EMAS with a 70-knot arrestment speed for the design aircraft and 600 feet of undershoot protection.[61] However, in the *Runway Safety Area Determination: Runway 15R-33L General Edward Lawrence Logan International Airport East Boston, Massachusetts*, dated January 30, 2009 (provided in Appendix A), the FAA determined that with 2 million passengers on board jet operations involving the Runway 33L RSA, it was justified to exceed the $25 million threshold.[62] While exceeding the cost threshold was determined to be justified, FAA was unable to justify the high cost of the pile-supported structure. Massport and FAA, based on FAA guidance, have eliminated this alternative from further analysis on the basis that it would be too expensive to build.

Conclusion

Based on FAA benefit/ cost guidance and review, Massport and FAA have eliminated Runway 33L Preliminary Alternative 2A – RSA with EMAS on Solid Fill with a Sheet Steel Bulkhead because it has significant constructability issues that would make this option difficult and costly to build and maintain. Runway 33L Preliminary Alternative 2B –RSA on Solid Fill with a Rip-Rap Stone Dike was also eliminated from further analysis on the basis that it would have the greatest potential impact to environmental resources of the three design options. Massport and FAA determined that of the three foundation structure options considered for Preliminary Alternative 2, Runway 33L Alternative 2C-RSA with EMAS on a Pile-Supported Deck would have the least environmental impact of the other two designs,[63] would not have the constructability issues of the bulkhead design option that would make it difficult to build and maintain, and would cost less than the bulkhead. However, at an estimated cost of approximately $93 million, Massport and FAA have eliminated this alternative from further analysis on the basis that it would be too expensive to build.

Runway 33L Preliminary Alternative 3 – 600-Foot Long and 400-Foot Wide RSA with EMAS on Pile-Supported Deck

Description of Alternative

As described for Runway 33L Preliminary Alternative 2, this alternative would extend the length of the existing RSA from 187.5 feet to 600 feet, however, the width of the RSA would be reduced from 500 to 400 feet. While the RSA would not fully comply with the current design criteria in the FAA's Airport Design Advisory Circular for RSAs[64] in terms of width, the FAA allows the reduction in safety area widths to 400 feet during construction, because the majority of aircraft overruns come to rest between the extended runway edge lines and because the risk of an undershoot occurring outside of the 400 foot width is reduced by centerline guidance of the CAT II ILS and MALSR visual aid on the runway. A length of less than 600 feet was not considered "since the marginal costs and environmental impacts were not judged significant enough to offset the compromises in RSA

61 Federal Aviation Administration, *Runway Safety Area Determination: Runway 15R-33L General Edward Lawrence Logan International Airport East Boston, Massachusetts*, January 30, 2009, p. 6.
62 Federal Aviation Administration, *Runway Safety Area Determination: Runway 15R-33L General Edward Lawrence Logan International Airport East Boston, Massachusetts*, January 30, 2009, p. 6.
63 Federal Aviation Administration, *Runway Safety Area Determination: Runway 15R-33L General Edward Lawrence Logan International Airport East Boston, Massachusetts*, January 30, 2009, p. 5.
64 United States Department of Transportation, Federal Aviation Administration, Advisory Circular (AC) 150/5300-13, Airport Design, Changes 1 through 13, June 19, 2008.

function"[65] associated with having an RSA with EMAS shorter than that specified in the current design criteria in the FAA's Airport Design Advisory Circular.

As for Runway 33L Preliminary Alternative 2, the existing 158-foot long and 170-foot wide EMAS bed (with 60 psi strength EMAS blocks) that is located in the existing RSA would be removed and replaced with a new EMAS bed constructed of 80 psi strength EMAS blocks and would have a total length of 500 feet. The EMAS bed would begin 40 feet from the runway's threshold. The FAA determined that because overrun protection relies upon the 170-foot wide EMAS bed, the probability that an overrun event would be affected by the reduction in width of the RSA is very remote.[66] As part of this alternative, the existing 20-foot wide airport perimeter road would be relocated between the runway's threshold and the EMAS bed (it is currently located at the end of the existing EMAS bed).

As described for Runway 33L Preliminary Alternatives 1 and 2, an emergency access ramp would be installed on each side of the RSA and ladders or concrete steps would be provided on the sides and end of the RSA, opportunities for reconfiguring the Taxiway C/ runway connection will be evaluated, and the localizer will be relocated. The localizer would be repositioned to the end of the RSA and installed on a 60-foot long and 160-foot wide pile-supported deck. The potential environmental impacts of installing any new navigational equipment and reconfiguring Taxiway C will be addressed in the Draft EA/ EIR as part of the cumulative assessment of the RSA enhancements at this location. As part of the planning for the RSA improvements at this location, Massport and FAA will also evaluate opportunities to reconfigure the Taxiway C/ runway connection to minimize future back-taxi needs.

Taking into account the new EMAS bed and extended RSA, the relocated perimeter road, and repositioned localizer, Runway 33L Preliminary Alternative 3 would have an overall estimated length of 660 feet and a width of 400 feet, of which, approximately 470 feet would extend into Boston Harbor (Figure 3-4). Based on the results of the alternatives screening for Runway 33L Preliminary Alternative 2, Massport and FAA only considered the pile-supported deck design for this alternative because it has fewer constructability issues than the other two design options, is less expensive than the bulkhead design option, and has fewer environmental impacts. The approximately 470-foot portion of the RSA (including the localizer) that would extend into Boston Harbor would be constructed on the pile-supported deck.

Results of Alternatives Screening

Runway 33L Preliminary Alternative 3 would result in impacts to environmental resources similar to the impacts described for Runway 33L Preliminary Alternative 2, however, because the structure is narrower, it would reduce the impacts to the majority of environmental resources including Coastal Bank, Coastal Beach, Land Under the Ocean, and Submerged Aquatic Vegetation (eelgrass).

65 Federal Aviation Administration, *Runway Safety Area Determination: Runway 15R-33L General Edward Lawrence Logan International Airport East Boston, Massachusetts*, January 30, 2009, p. 5.

66 Federal Aviation Administration, *Runway Safety Area Determination: Runway 15R-33L General Edward Lawrence Logan International Airport East Boston, Massachusetts*, January 30, 2009, p. 6.

Environmental Resource Impacts

The potential impacts of Runway 33L Preliminary Alternative 3 to environmental resources include:

- Coastal Bank – Coastal Bank would be eliminated along the width of the structure. Approximately 441 linear feet would be impacted.
- Coastal Beach – Coastal Beach would be eliminated only where pilings are installed. The pilings may also have indirect impacts, potentially resulting in a change in form and volume of the Coastal Beach in the area beneath the deck.
- Land Under the Ocean – Land Under the Ocean would only be eliminated where pilings are installed.
- Land Containing Shellfish – Land Containing Shellfish would be lost only where pilings are installed. There could also be a potential change in productivity of the area adjacent to the filled structures and beneath the deck due to a potential change in the distribution of sediment grain size (refer to the section below that describes changes in coastal processes). However, habitat for shellfish would continue to be available as filter feeders and detritivores would not likely be significantly affected. The pilings beneath the high water mark would provide substrate for attached and mobile intertidal and subtidal invertebrates including mussels.
- Submerged Aquatic Vegetation (eelgrass) - Eelgrass would be eliminated where pilings are installed. However, a large area beneath the pile-supported structure of approximately 71,420 square feet would be fully blocked from sunlight and therefore would not be able to sustain eelgrass beds, which require light penetration to support photosynthesis. Eelgrass would still be able to grow in areas beneath the outer edge of the deck that are exposed to sunlight for part of the day. The slight increase in sedimentation that may occur beneath the deck (refer to the section below that describes changes in coastal processes) could potentially cover small areas of eelgrass beds.

Changes in Coastal Processes

The pile-supported structure would be expected to have minimal impacts on coastal processes. There would be minimal impact on tidal circulation and flow, and currents would generally move unimpeded under the pile-supported structure with some reduction in speed due to the presence of the piles. Assuming there is transport of sediment past the site currently, there would be some sedimentation near the intersection of the filled structures and the shoreline. Unless the structures and shoreline are suitably protected with rip-rap, there would be some erosion of the shoreline and harbor bottom. Based on observation of the existing pile-supported light pier at this location, an expanded pile-supported structure would not be expected to have a significant adverse impact on erosion and sedimentation of the harbor bottom and adjacent shoreline, however, sedimentation may increase slightly beneath the structure due to the slight reduction in speed of the currents due to the presence of the piles. Similar to the existing piles, a small amount of erosion of the harbor bottom may occur around the new piles.

Constructability and Cost

As described previously, the FAA has a maximum feasible cost threshold of $25 million for safety area improvements using EMAS with a 70-knot arrestment speed for the design aircraft and 600 feet of undershoot protection.[67] However, in the *Runway Safety Area Determination: Runway 15R-33L General Edward Lawrence Logan International Airport East Boston, Massachusetts*, dated January 30, 2009 (provided in Appendix A), the FAA determined that with 2 million passengers on board jet aircraft operations involving the Runway 33L RSA, it is justified to exceed the $25 million threshold.[68] While exceeding the cost threshold was determined to be justified, the FAA was unable to justify the extremely high cost of the pile-supported structure at $79 million (includes the cost of design, permitting, construction, and mitigation). Massport and FAA have eliminated this alternative from further analysis on the basis that it would be too expensive to build.

Conclusion

This alternative would have reduced impacts to environmental resources in Boston Harbor compared to Runway 33L Preliminary Alternatives 1 and 2. However, at an estimated cost of approximately $79 million, Massport and FAA have eliminated this alternative from further analysis on the basis that it would still be too expensive to build.

Runway 33L Preliminary Alternative 4 - 600-Foot Long and 300-Foot Wide RSA with EMAS on Pile-Supported Deck

Description of Alternative

As described for Runway 33L Preliminary Alternative 3, this alternative would extend the length of the existing RSA from 187.5 feet to 600 feet, however, the width of the RSA would be reduced from 400 to 300 feet. While the RSA would not fully comply with the current design criteria in the FAA's Airport Design Advisory Circular for RSAs[69] in terms of width, and the FAA determined that the risk of an undershoot occurring outside of the 300-foot width is reduced by centerline guidance of the CAT II ILS and MALSR visual aid on the runway.[70] A length of less than 600 feet was not considered "since the marginal costs and environmental impacts were not judged significant enough to offset the compromises in RSA function"[71] associated with having an RSA with EMAS shorter than that specified in the current design criteria in the FAA's Airport Design Advisory Circular as well as maintaining the 600 feet for undershoot protection.

As for Runway 33L Preliminary Alternative 3, the existing 158-foot long and 170-foot wide EMAS bed (with 60 psi strength EMAS blocks) that is located in the existing RSA would be removed and replaced with a new

67 Federal Aviation Administration, *Runway Safety Area Determination: Runway 15R-33L General Edward Lawrence Logan International Airport East Boston, Massachusetts*, January 30, 2009, p. 6.
68 *ibid*.
69 United States Department of Transportation, Federal Aviation Administration, *Advisory Circular (AC) 150/5300-13, Airport Design, Changes 1 through 13,* June 19, 2008.
70 Federal Aviation Administration, *Runway Safety Area Determination: Runway 15R-33L General Edward Lawrence Logan International Airport East Boston, Massachusetts*, January 30, 2009, p. 6.
71 Federal Aviation Administration, *Runway Safety Area Determination: Runway 15R-33L General Edward Lawrence Logan International Airport East Boston, Massachusetts*, January 30, 2009, p. 5.

EMAS bed constructed of 80 psi strength EMAS blocks and would have a total length of 500 feet. The EMAS bed would begin 40 feet from the runway's threshold. The FAA determined that because overrun protection relies upon the 170-foot wide EMAS bed, the probability that an overrun event would be affected by the reduction in width of the RSA is very remote. FAA also determined that reductions below 300 feet would be unacceptable due to the need for a corridor on either side of the EMAS bed for emergency response and maintenance vehicles to safely maneuver and turn around without the risk of driving off and over the deck.[72] As part of this alternative, the existing 20-foot wide airport perimeter road would be relocated between the runway's threshold and the EMAS bed (it is currently located at the end of the existing EMAS bed).

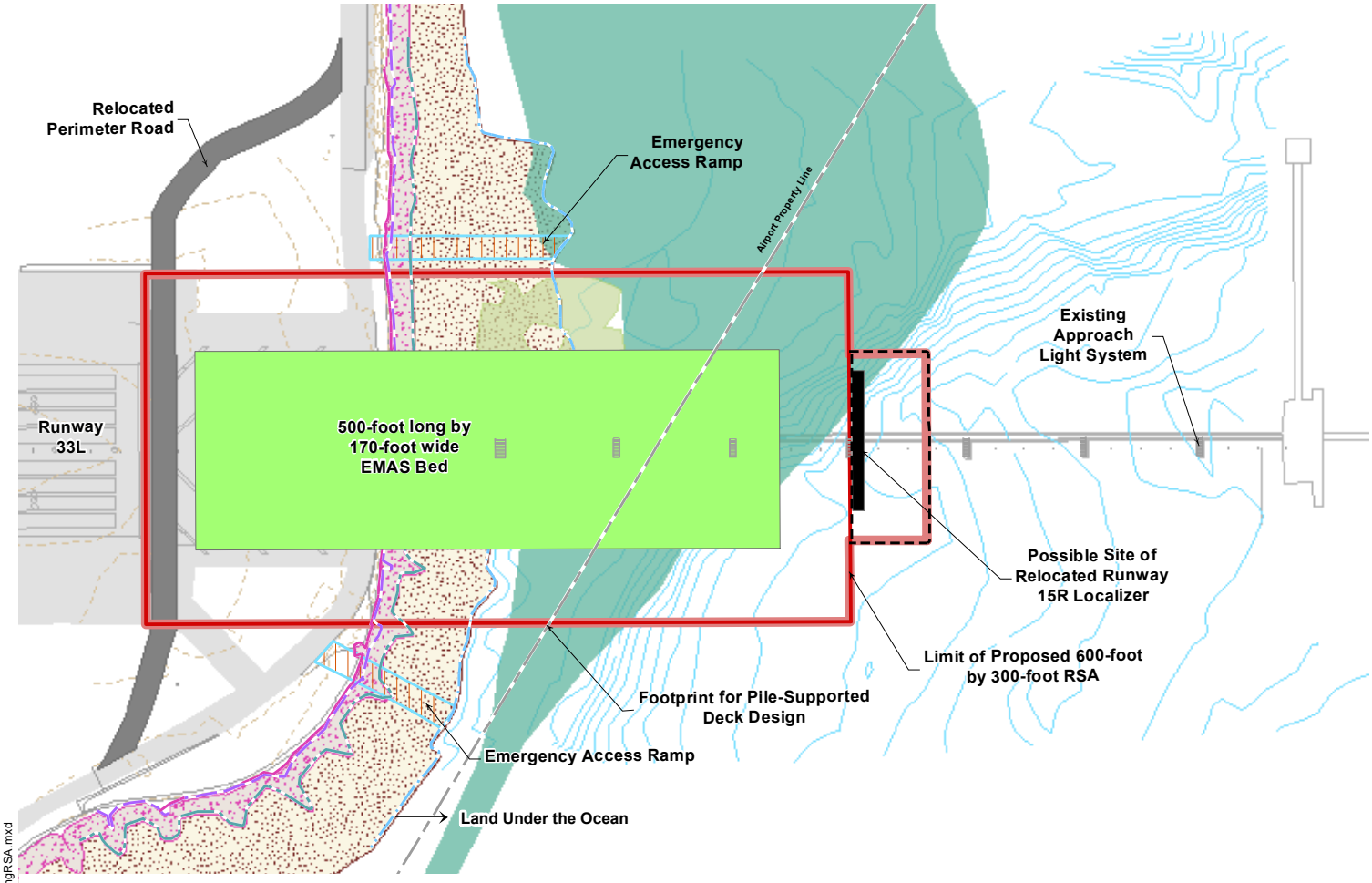
Overall, the FAA determined that:

"It is not practical for [the Runway 33L RSA] to meet full standards but it can be improved with a 600 [foot] by 300 [foot] runway safety area with 70 knot EMAS protection for Boeing 747-400, subject to environmental review and approvals."[73] The FAA also determined that "reductions below 300 feet are unacceptable due to the need for a corridor on either side of the EMAS bed for emergency response and maintenance vehicles."[74]

As described for Runway 33L Preliminary Alternatives 1, 2, and 3, an emergency access ramp would be installed on each side of the RSA and ladders or concrete steps would be provided on the sides and end of the RSA, opportunities for reconfiguring the Taxiway C/ runway connection will be evaluated, and the localizer will be relocated. The localizer would be repositioned to the end of the RSA and installed on a 60-foot long and 160-foot wide pile-supported deck. The potential environmental impacts of installing any new navigational equipment and reconfiguring Taxiway C will be addressed in the Draft EA/ EIR as part of the cumulative assessment of the RSA enhancements at this location. As part of the planning for the RSA improvements at this location, Massport and FAA will also evaluate opportunities to reconfigure the Taxiway C/ runway connection to minimize future back-taxi needs.

Taking into account the new EMAS bed and extended RSA, the relocated perimeter road, and repositioned localizer, Runway 33L Preliminary Alternative 4 would have an overall estimated length of 660 feet and a width of 300 feet, of which approximately 470 feet would extend into Boston Harbor (Figure 3-5). Based on the results of the alternatives screening for Runway 33L Preliminary Alternatives 2 and 3, Massport and FAA only considered the pile-supported deck design for this alternative because it does not have the constructability issues of the other two design options (the rip-rap stone dike and bulkhead), is less expensive than the bulkhead design option, and has fewer environmental impacts. The approximately 470-foot portion of the RSA (including the localizer) that would extend into Boston Harbor would be constructed on the pile-supported deck.

72 Federal Aviation Administration, *Runway Safety Area Determination: Runway 15R-33L General Edward Lawrence Logan International Airport East Boston, Massachusetts*, January 30, 2009, p. 6.
73 Federal Aviation Administration, *Runway Safety Area Determination: Runway 15R-33L General Edward Lawrence Logan International Airport East Boston, Massachusetts*, January 30, 2009, p. 7.
74 Federal Aviation Administration, *Runway Safety Area Determination: Runway 15R-33L General Edward Lawrence Logan International Airport East Boston, Massachusetts*, January 30, 2009, p. 6.



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0 150 Feet

Legend

- New EMAS Bed
- Footprint for Pile-Supported Deck
- RSA Footprint
- Emergency Ramps
- Pile-Supported Deck for Localizer
- Existing Contour
- Existing Bathymetric Contour
- Mean High Water (4.58')
- Mean Low Water (-4.51')
- Top of Coastal Bank
- Limit of Land Subject to Coastal Storm Flowage
- Mussel Bed
- Limit of Eelgrass
- Coastal Bank
- Coastal Beach

massport

LOGAN AIRPORT RSA Runway Safety Area Improvement Project

Logan RSA

Figure 3-5

Runway 33L Preliminary Alternative 4

Source: Jacobs Edwards & Kelcey, Inc.
Childs Engineering Corps.
VHB Fieldwork - 2008

Results of Alternatives Screening

The Runway 33L Preliminary Alternative 4 would result in impacts to environmental resources similar to the impacts described for Runway 33L Preliminary Alternative 3, however, because the structure is narrower, it would reduce the impacts to the majority of environmental resources including Coastal Bank, Coastal Beach, Land Under the Ocean, and Submerged Aquatic Vegetation (eelgrass).

Environmental Resource Impacts

In the *Runway Safety Area Determination: Runway 15R-33L General Edward Lawrence Logan International Airport East Boston, Massachusetts*, dated January 30, 2009 (provided in Appendix A), the FAA determined that the alternative would have reduced impacts to environmental resources in Boston Harbor compared to all of the Runway 33L Preliminary Alternatives. The potential environmental impacts of Runway 33L Preliminary Alternative 4 are detailed in Chapter 4 of this narrative.

Changes in Coastal Processes

As described for Runway 33L Preliminary Alternative 3, the pile-supported structure would have little to no impact on coastal processes. There would be little to no impact on tidal circulation and flow, and currents would generally move unimpeded under the pile-supported structure with some reduction in speed due to the presence of the piles. Assuming there is transport of sediment past the site currently, there would be some sedimentation near the intersection of the filled structures and the shoreline. Unless the structures and shoreline are suitably protected with rip-rap there would be some erosion of the shoreline and harbor bottom. The pile-supported structure would have little to no impact on erosion and sedimentation of the harbor bottom and adjacent shoreline, however, sedimentation may increase slightly beneath the structure due to the slight reduction in speed of the currents due to the presence of the piles. Similar to the existing light pier, a small amount of erosion of the harbor bottom may occur around the piles.

Constructability and Cost

As described previously, the FAA has a maximum feasible cost threshold of $25 million for safety area improvements using EMAS with a 70-knot arrestment speed for the design aircraft and 600 feet of undershoot protection.[75] The Runway 33L Preliminary Alternative 4 would cost approximately $58 million (including the cost of design, permitting, construction, and mitigation). However, in the *Runway Safety Area Determination: Runway 15R-33L General Edward Lawrence Logan International Airport East Boston, Massachusetts*, dated January 30, 2009 (provided in Appendix A), the FAA determined that with 2 million passengers on board jet aircraft operations involving the Runway 33L RSA it is justified to exceed the $25 million threshold.[76] FAA also determined, and Massport agreed, that although the alternative would not fully comply with the current design

75 Federal Aviation Administration, *Runway Safety Area Determination: Runway 15R-33L General Edward Lawrence Logan International Airport East Boston, Massachusetts*, January 30, 2009, p. 6.
76 *ibid*.

criteria in the FAA's Airport Design Advisory Circular for RSAs[77] in terms of width, it would maintain runway utility and capacity, and would provide protection and functionality near equivalent to a RSA that meets the design criteria.[78] It would do so at a reduced cost compared to the Runway 33L Preliminary Alternatives, and at a cost acceptable to FAA and Massport.[79]

Conclusion

This alternative would maintain runway utility and capacity, and would provide protection and functionality near equivalent to a RSA that meets the design criteria.[80] Massport and FAA have retained this alternative for further analysis in the Draft EA/ EIR on the basis that it was the alternative proposed by the FAA in their determination based on environmental impacts and cost. The FAA also stated in their determination that because overrun protection relies upon the 170-foot wide EMAS bed, the probability that an overrun event would be affected by reduction in the width of the RSA is very remote.

3.1.2.5 Runway 33L No-Action Alternative

The NEPA process requires that the proposed action be compared to the No-Action Alternative. The No-Action Alternative assumes that Runway 33L RSA enhancements would not occur. As required by NEPA and MEPA, the No-Action Alternative (No-Build) will be used as the baseline to evaluate the environmental impacts of the alternatives carried forward for analysis in the Draft EA/ EIR. In accordance with the requirements of NEPA and MEPA, Massport and FAA have retained this alternative for further analysis for comparative purposes only within the environmental review process.

3.2 Runway 22R

Section 3.2.1 provides a description of Runway 22R and its use. Section 3.2.2 details the screening criteria applied to each alternative, provides a description of the RSA alternatives considered by Massport for Runway 22R, and identifies the alternatives to be carried forward for detailed analysis in the Draft EA/ EIR.

3.2.1 Description and Use of Runway 22R

At 7,860 feet, Runway 4L-22R is the third longest at Logan Airport. As shown on Figure 1-1, the Runway 22R end is at the northern end of the airfield, and the Runway 4L end is at the southern end. Runway 22R has an 815-foot displaced threshold, which reduces the length of runway available for arrivals. The paved area behind the threshold is available for departures and roll-out for runway 4L arrivals. The threshold for Runway 22R is displaced because of obstructions (buildings) in Orient Heights.

77 United States Department of Transportation, Federal Aviation Administration, *Advisory Circular (AC) 150/5300-13, Airport Design, Changes 1 through 13,* June 19, 2008.
78 Federal Aviation Administration, *Runway Safety Area Determination: Runway 15R-33L General Edward Lawrence Logan International Airport East Boston, Massachusetts*, January 30, 2009, p. 6.
79 *ibid*.
80 *ibid*.

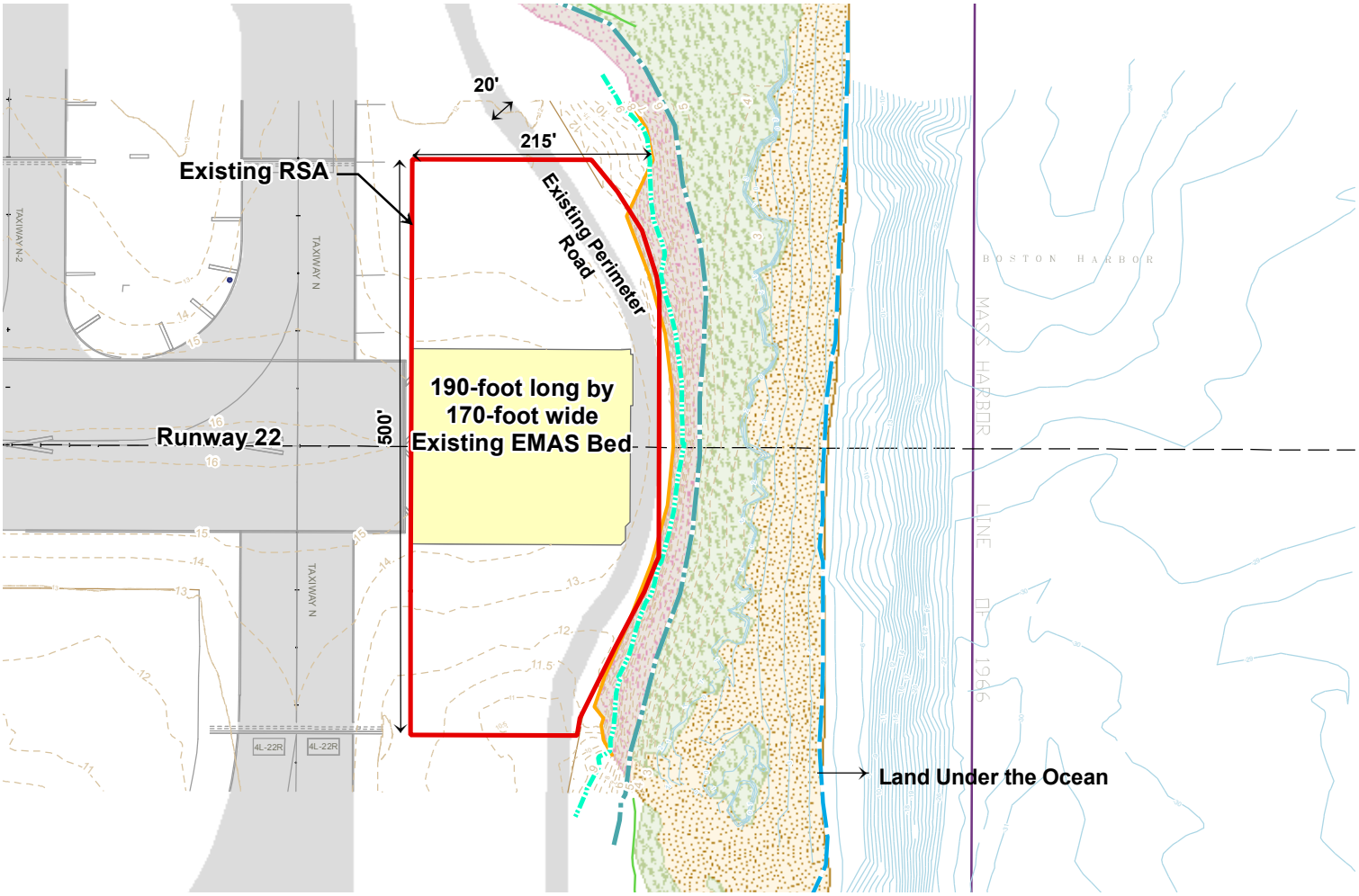
Runway 22R is used primarily for aircraft departures, while Runway 4L is used primarily for aircraft arrivals. In 2007, Runway 22R accommodated 33 percent of all jet aircraft departures, while the opposite end of the runway, Runway 4L, accommodated 5 percent of all jet aircraft arrivals (Table 3-1).[81] Although Runway 4L-22R accommodates a number of different aircraft including turboprops and heavy, light, and regional jets (Table 3-3), it is designed to handle heavy commercial jet aircraft. In 2007, Runway 4L-22R was used most frequently for arrivals by turboprops and regional jets but was used by a number of different aircraft including turboprops and heavy, light, and regional jets for departures.

While the EMAS system currently installed on Runway 22R complies with the FAA minimum for arrestment speeds, the RSA does not comply with undershoot requirements. In reviewing the layout and functionality of Runway 22R, historically this runway has very rarely been used for arrivals. In addition, its arrival threshold is displaced 815-feet from the actual end of the runway. While this 815-foot displacement area is available for Runway 4L arrival roll-out, and Runway 22R departures, it is not available for Runway 22R arrivals and, according to the FAA, can be used to satisfy undershoot requirements. The remaining requirement for vertical guidance has been satisfied through the installation of a PAPI. Therefore, the Runway 22R RSA is intended to protect aircraft in the event that an aircraft arriving on Runway 4L overruns and fails to stop on the runway. Runway 4L has a 1,000-foot long RSA.

The RSA for Runway 22R is 215 feet long and 500 feet wide (Figure 3-6). A 190-foot long and 170-foot wide EMAS bed for aircraft overrun protection was constructed in 2005. The EMAS bed is set back five feet from the runway threshold and meets the design criteria in the FAA's Airport Design Advisory Circular,[82] providing the minimum FAA-defined arrestment speed of 40 knots for the design aircraft (Boeing 757-200). The EMAS bed is designed to stop the design aircraft if it is traveling at speeds of 40 knots or less when it leaves the end of the runway. The Runway 22R EMAS bed also provides arrestment at higher speeds for many of the smaller aircraft frequently using this runway. The arresting performance improves with lighter aircraft. The EMAS bed will arrest a Boeing 737-800 that leaves the runway at 51 to 57 knots and a CRJ-200 that leaves the runway at 60 to 66 knots.[83] The level of safety provided by the existing RSA with EMAS was all that was possible without extending the RSA into Boston Harbor.

The existing airport perimeter road is located at the northern edge of the existing EMAS bed, within the RSA. One navaid, a PAPI, is located at the Runway 22R end.

81 Massachusetts Port Authority, *Boston-Logan International Airport 2007 Environmental Data Report*, September 2008.
82 United States Department of Transportation, Federal Aviation Administration, *Advisory Circular (AC) 150/5300-13, Airport Design, Changes 1 through 13,* June 19, 2008.
83 SH & E, Inc, Edwards and Kelcey, Inc., Flight Transportation Associates, Inc., *Runway 4L/22R Safety Area Analysis*, March 29, 2004, p. 16.



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0 150 Feet

Legend

- Existing RSA
- Existing EMAS Bed
- Coastal Bank
- Coastal Beach
- Salt Marsh
- Existing Contour
- Existing Bathymetric Contour
- Mean High Water (4.58')
- Mean Low Water (-4.51')
- Top of Coastal Bank
- Limit of Land Subject to Coastal Storm Flowage

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Logan RSA

Figure 3-6

Existing Runway 22R RSA

Source: Jacobs Edwards & Kelcey, Inc.
Childs Engineering Corps.
Office of Geographic and Environmental Information (2004, 2006 MassGIS)

Table 3-3 Runway 4L-22R Aircraft Fleet Mix (2007)

	Arrivals						
Runway	Heavy Jets A[1]	Heavy Jets B[2]	Light Jets A[3]	Light Jets B[4]	Regional Jets[5]	Turboprops (Non-jets)[6]	Total Operations
4L	0.09%	0.38%	1.71%	12.50%	44.79%	40.54%	100.00%
22R	0.00%	0.20%	0.00%	0.70%	3.84%	95.26%	100.00%
Total	0.09%	0.58%	1.71%	13.20%	48.63%	135.80%	

	Departures						
Runway	Heavy Jets A[1]	Heavy Jets B[2]	Light Jets A[3]	Light Jets B[4]	Regional Jets[5]	Turboprops (Non-jets)[6]	Total Operations
4L	0.06%	0.09%	0.11%	0.35%	2.02%	97.38%	100.00%
22R	0.93%	3.40%	5.24%	44.67%	34.16%	11.60%	100.00%
Total	0.99%	3.49%	5.35%	45.02%	36.18%	108.98%	

Source: 2007 modeled operation data generated by HMMH for the Massachusetts Port Authority, *Boston-Logan International Airport 2007 Environmental Data Report*, September 2008.

1. Heavy Jets A= Boeing 747s, Airbus 340s, DC-8s;
2. Heavy Jets B = Boeing 767s, Boeing 777s, Airbus 300s, Airbus 310s, Airbus 330s, DC-10s, L1011s, Boeing/McDonnell Douglas MD11s;
3. Light Jets A = Boeing 717s, Boeing 727s, DC-9s, F100s, Boeing/McDonnell Douglas MD90s;
4. Light Jets B = Boeing 737s, Boeing 757s, Airbus 319s, Airbus 320s, Beech 146s, Boeing/McDonnell Douglas MD80s;
5. Regional Jet = Embraer 135, Embraer 145, Embraer 170, Embraer 190, Bombardier CRJ 2, Bombardier CRJ 7, Bombardier CRJ 9, Fairchild Dornier 328JET
6. Corporate Jets and Turboprops = Beech King Air, Cessna 402

3.2.2 Runway Safety Area Enhancement Alternatives for Runway 22R

This section describes the process undertaken by Massport and FAA to identify reasonable alternatives for enhancing the Runway 22R RSA. Massport is seeking to enhance the existing RSA (which already meets the minimum FAA design criteria) in order to comply with FAA's request to consider options for further enhancing the level of safety provided by the RSA. Section 3.2.2.1 contains a description of the alternatives considered by Massport and identifies the alternatives to be carried forward for detailed analysis in the Draft EA/ EIR. Each of the alternatives was analyzed by applying the screening criteria presented in Section 3.2.2.2.

In 2004, Massport commissioned an evaluation of alternatives for improving the RSA at the end of Runway 22R. The evaluation recommended installing an EMAS bed, which Massport installed in 2005. The EMAS bed, which has an arrestment speed of 40 knots for the design aircraft, meets the FAA's minimum standards for the design aircraft and also provides arrestment at higher speeds for many of the smaller aircraft frequently using this runway, and could be constructed with no wetland impacts. However, as part of the approval of the EMAS bed, the FAA required Massport to investigate options to further enhance safety at this runway end.[84]

84 Federal Aviation Administration, *Runway Safety Area Determination: General Edward Lawrence Logan International Airport East Boston, Massachusetts*, June 6, 2004, p. 1.

3.2.2.1 Alternatives Screening Criteria

Massport conducted a RSA feasibility analysis for the Runway 22R end. The results of that analysis combined with the FAA review and determination approved the placement of a 190-foot long EMAS bed with the requirement of follow-on work to determine additional practical actions that could further enhance safety. As part of this RSA study, the technical team reviewed the operational use of Runway 4L/ 22R and possible options to further enhance the safety area, environmental impacts, and related costs. Based on this review, Massport is proposing to maintain the EMAS and enhance the safety end with an inclined transition from the runway to the water. This would achieve the safety goal while minimizing environmental impacts and costs. Furthermore, a cost/ benefit analysis was conducted to measure the feasibility of implementing each RSA enhancement alternative. The FAA's maximum feasible cost thresholds for safety area improvements using EMAS were used to screen the alternatives on the basis of cost: While the intent of the FAA's maximum feasible cost thresholds are intended to compare standard RSAs to Standard EMAS installations (EMAS with a 600 foot-long RSA), the FAA further states that if neither the standard RSA nor the standard EMAS are financially feasible, than that maximum cost threshold should be used when developing non-standard safety enhancements.[85] Using this guidance, the following costs have been developed:[86]

- $8 million for a 190-foot EMAS Bed with 40-knot Arrestment Speed[87]
- $11.75 million for a 283.5-foot EMAS Bed with 50-knot Arrestment Speed
- $16 million for a 372.6-foot EMAS Bed with 60-knot Arrestment Speed
- $20 million for a 465.75-foot EMAS Bed with 70-knot Arrestment Speed

Environmental impacts, particularly to salt marsh, were also considered. The screening process for the Runway 22R RSA enhancement alternatives is shown in Figure 3-7.

3.2.2.2 Alternatives Considered

In 2007, Massport commissioned an assessment of the feasibility of enhancing the Runway 22R RSA by extending the existing EMAS bed or installing an inclined safety area. Based on that feasibility study, and with input from FAA, the following four alternatives were developed:

- Runway 22R Alternative 1 – EMAS Enhancement on Solid Fill
- Runway 22R Alternative 2 – EMAS Enhancement on a Pile-Supported Deck
- Runway 22R Alternative 3 – EMAS Replacement Using 80 psi Strength Blocks in Current Configuration
- Runway 22R Alternative 4 – Inclined Safety Area

85 FAA Order 5200.9, entitled, Financial Feasibility and Equivalency of Safety Area Improvements and Engineered Material Arresting Systems provides guidance as to the maximum feasible cost for RSA improvements involving the installation of EMAS beds.
86 FAA Order 5200.9, entitled, *Financial Feasibility and Equivalency of Safety Area Improvements and Engineered Material Arresting Systems* provides guidance as to the maximum feasible cost for RSA improvements involving the installation of EMAS beds.
87 The cost of installing the existing 190-foot EMAS bed was well below the FAA's cost thresholds for safety area improvements using EMAS.

Screening Criteria: Cost

Alternative 1	Alternative 2	Alternative 3	Alternative 4
EMAS enhancement on solid fill	EMAS enhancement on pile-supported deck	EMAS replacement using 80 psi strength blocks in current configuration	Inclined safety area
Eliminated	***Eliminated***	***Eliminated***	***Retained***

Figure 3-7

Runway 22R
Alternatives Screening Process

Runway 22R Alternative 1 - EMAS Enhancement on Solid Fill

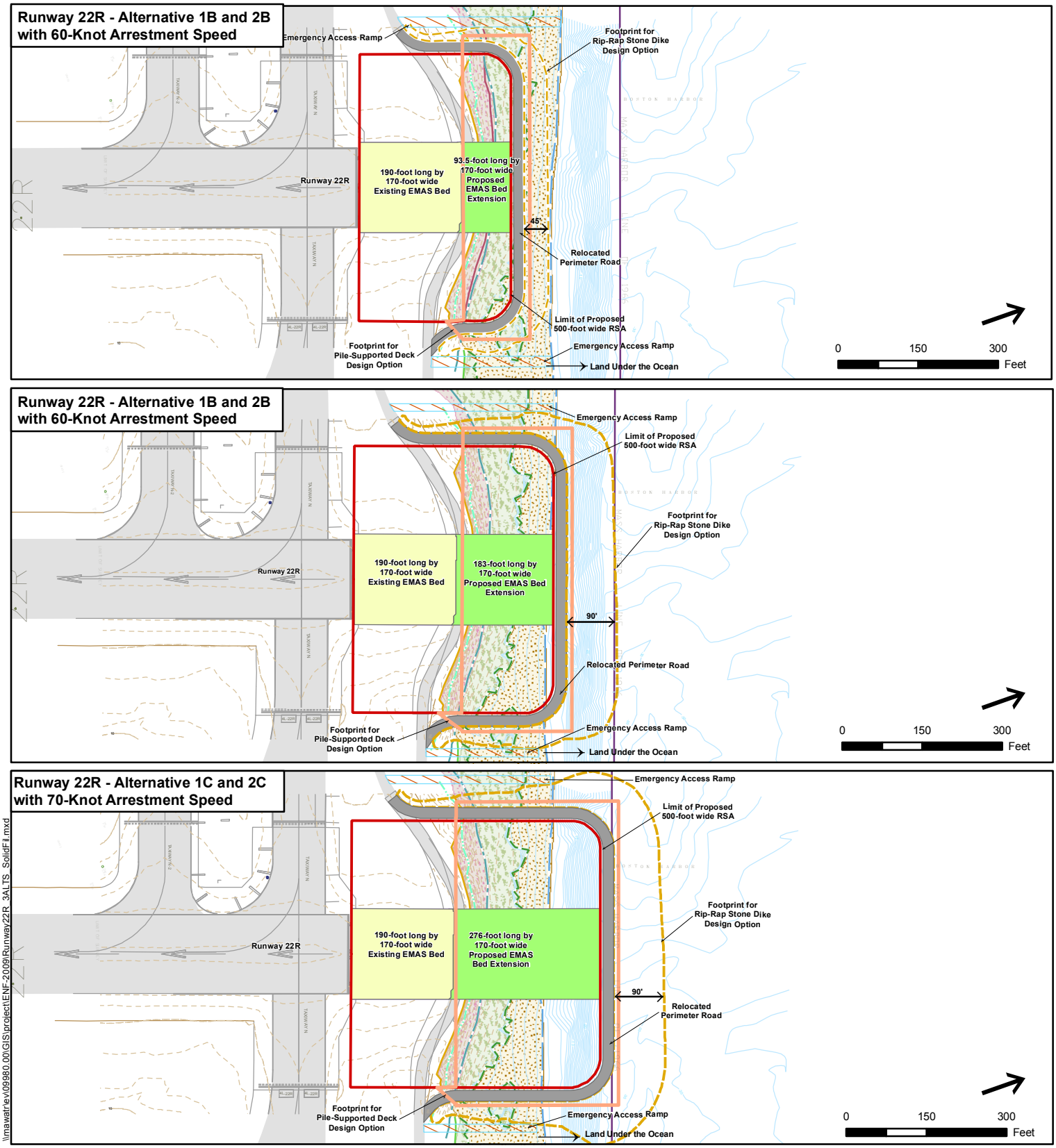
Description of Alternative

This alternative would extend the existing EMAS bed, which is constructed of 60 psi strength blocks, in order to achieve greater arrestment speeds in the event of an aircraft overrun. As described previously in Section 2.3 of this narrative, the existing EMAS bed provides significant benefit to the majority of aircraft using this runway, and meets the minimum FAA-defined arrestment speed of 40 knots for the design aircraft (Boeing 757-200). For this alternative, three different arrestment speeds were considered, each of which would be constructed of 60 psi strength EMAS blocks supported on a solid fill structure. The arrestment speeds considered were:

- Runway 22R Alternative 1A – 50-knot arrestment speed
- Runway 22R Alternative 1B – 60-knot arrestment speed
- Runway 22R Alternative 1C – 70-knot arrestment speed

The construction technique for the solid fill platform would be the same for Runway 22R Alternatives 1A, 1B, and 1C, but the length of the extended EMAS bed and the number of additional rows of EMAS blocks required to extend the bed would vary for each of the three alternatives. The three alternatives were considered to minimize the extent of impact to coastal wetland resources in Boston Harbor and would vary depending on the length of the extended EMAS bed. For Runway 22R Alternative 1A, 25 additional rows of 60 psi strength EMAS blocks, or 93 additional feet, would have to be installed at the northern end of the existing EMAS bed in order to increase the arrestment speed to 50 knots. Approximately 47 additional rows of 60 psi strength EMAS blocks, or 183 additional feet, would be required for Runway 22R Alternative 1B. Seventy additional 60 psi strength EMAS blocks, or 276 additional feet, would be required for Runway 22R Alternative 1C. Figure 3-8 depicts the conceptual Runway 22R safety area and EMAS bed for Runway 22R Alternatives 1A, 1B, and 1C.

In order to provide a stable platform for the extended EMAS bed, fill would need to be placed in Boston Harbor for all three alternatives. A maximum area of approximately 272,760 square feet would be covered in fill to support the new safety area for Runway 22R Alternative 1C, of which approximately 250,580 square feet of fill would be in Boston Harbor. A rip-rap rock stone slope would be constructed around the perimeter of the proposed fill, and additional fill would be placed inside the rip-rap to bring the grade up to support the installation of the new EMAS blocks. The existing airport perimeter road would be relocated out and around the extended RSA, with 10 feet of clearance provided between the road and the RSA. An emergency access ramp would be installed on both sides of the RSA to provide first responders with access points between the water and the airfield. The emergency access ramps would consist of a 20-foot wide rip-rap rock stone slope (30 percent grade) with a gravel surface. Either ladders or concrete steps would be provided on the sides and end of the RSA to allow passengers and aircraft crew to easily climb out of the water in the event an aircraft overruns the end of the runway and RSA, and enters the water.


Runway 22R - Alternative 1B and 2B with 60-Knot Arrestment Speed
Emergency Access Ramp
Footprint for Rip-Rap Stone Dike Design Option
Runway 22R
190-foot long by 170-foot wide Existing EMAS Bed
93.5-foot long by 170-foot wide Proposed EMAS Bed Extension
45'
Relocated Perimeter Road
Limit of Proposed 500-foot wide RSA
Footprint for Pile-Supported Deck Design Option
Emergency Access Ramp
Land Under the Ocean
0
150
300
Feet
Runway 22R - Alternative 1B and 2B with 60-Knot Arrestment Speed
Emergency Access Ramp
Limit of Proposed 500-foot wide RSA
Footprint for Rip-Rap Stone Dike Design Option
Runway 22R
190-foot long by 170-foot wide Existing EMAS Bed
183-foot long by 170-foot wide Proposed EMAS Bed Extension
90'
Relocated Perimeter Road
Footprint for Pile-Supported Deck Design Option
Emergency Access Ramp
Land Under the Ocean
0
150
300
Feet
Runway 22R - Alternative 1C and 2C with 70-Knot Arrestment Speed
Emergency Access Ramp
Limit of Proposed 500-foot wide RSA
Footprint for Rip-Rap Stone Dike Design Option
Runway 22R
190-foot long by 170-foot wide Existing EMAS Bed
276-foot long by 170-foot wide Proposed EMAS Bed Extension
90'
Relocated Perimeter Road
Footprint for Pile-Supported Deck Design Option
Emergency Access Ramp
Land Under the Ocean
0
150
300
Feet
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Legend

- RSA Footprint
- Footprint for Pile-Supported Deck
- Fooprint for Rip-Rap Stone Dike
- 20-foot wide Relocated Perimeter Road
- Emergency Access Ramps
- Existing EMAS Bed
- Extended EMAS Bed
- Existing Contour
- Existing Bathymetric Contour
- Mean High Water (4.58')
- Mean Low Water (-4.51')
- Top of Coastal Bank
- Limit of Land Subject to Coastal Storm Flowage
- Coastal Bank
- Coastal Beach
- Salt Marsh

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L o g a n R S A

Figure 3-8

Runway 22R Alternative 1 - EMAS Enhancement on Solid Fill and Alternative 2 - EMAS Enhancement on Pile-Supported Deck

Results of Alternatives Screening

The cost to extend the existing EMAS bed on solid fill is estimated to be approximately $17.5 million, $31.71 million, and $47.41 million for Runway 22R Alternatives 1A, 1B, and 1C, respectively.[88] At this level of screening, the cost estimates do not include the cost of mitigation. The cost estimates exceed the FAA's maximum feasible RSA improvement cost guidelines by 49 percent for Runway 22R Alternative 1A, 98 percent for Runway 22R Alternative 1B, and 137 percent for Runway 22R Alternative 1C. Considering that the cost estimates exceed the FAA's maximum feasible RSA improvement cost guidelines and that the existing RSA currently meets the FAA's current minimum design standard for stopping the design aircraft for Runway 22R (Boeing 757-200), none of the conceptual improvements would be considered financially feasible by the FAA as options for further enhancing the level of safety provided by the RSA. The FAA's cost guidelines are $11.75 million, $16 million, and $20 million for EMAS beds with arrestment speeds of 50, 60, and 70 knots, respectively.

Conclusion

Massport and FAA eliminated this alternative because it would not be considered financially feasible by the FAA as an option for further enhancing the level of safety provided by the existing RSA.

Runway 22R Alternative 2 - EMAS Enhancement on a Pile-Supported Deck

Description of Alternative

This alternative is the same as Runway 22R Alternative 1, but would use a pile-supported deck to minimize impacts to environmental resources. As with Runway 22R Alternative 1, this alternative would extend the existing 60 psi strength EMAS bed in order to achieve greater arrestment speeds. The same three arrestment speeds were considered to minimize environmental impacts:

- Runway 22R Alternative 2A – 50-knot arrestment speed
- Runway 22R Alternative 2B – 60-knot arrestment speed
- Runway 22R Alternative 2C – 70-knot arrestment speed

The number of additional 60 psi strength EMAS blocks and the length of the extended EMAS bed would also be the same as Runway 22R Alternative 1 for each arrestment speed.

A pile-supported deck construction has the benefit of minimizing impacts to coastal wetland resources compared to the impacts of constructing a solid fill platform considered in Runway 22R Alternative 1. The deck would be 123, 203, or 303 feet long to accommodate extension of the EMAS bed for Runway 22R Alternatives 2A, 2B, and 2C, respectively. The additional rows of 60 psi strength EMAS blocks needed to extend the existing EMAS bed would be installed directly on top of the deck. The existing airport perimeter road would be relocated out and around the extended RSA, with 10 feet of clearance provided between the road and the RSA. An emergency access ramp would be installed on both sides of the extended safety area to provide first

88 Vanasse Hangen Brustlin, *Alternatives Feasibility Study Technical Report, Boston Logan International, East Boston, Massachusetts*, September, 2007.

responders with access points between the water and the airfield. The emergency access ramps would consist of a 20-foot wide rip-rap rock stone slope (30 percent grade) with a gravel surface. Ladders would be provided on the sides and end of the RSA to allow passengers and aircraft crew to easily climb out of the water in the event an aircraft overruns the end of the runway and RSA, and enters the water.

Results of Alternatives Screening

The cost to extend the existing EMAS bed on a pile-supported deck is estimated to be $23.70 million, $35.95 million, and $50.56 million for Runway 22R Alternatives 2A, 2B, and 2C, respectively.[89] At this level of screening, the cost estimates do not include the cost of mitigation. The cost estimates exceed the FAA's maximum feasible RSA improvement cost guidelines by 102 percent for Runway 22R Alternative 2A, 125 percent for Runway 22R Alternative 2B, and 153 percent for Runway 22R Alternative 2C. Considering that the cost estimates exceed the FAA's maximum feasible RSA improvement cost guidelines and that the existing RSA currently meets the FAA's minimum design standard for stopping the design aircraft for Runway 22R (Boeing 757-200), none of the conceptual improvements would be considered financially feasible by the FAA as options for further enhancing the level of safety provided by the RSA.

Conclusion

Massport and FAA eliminated this alternative because it would not be considered financially feasible by the FAA as an option for further enhancing the level of safety provided by the existing RSA.

Runway 22R Alternative 3 – EMAS Replacement Using 80 psi Strength Blocks in Current Configuration

Although 80 psi strength blocks could be used to potentially replace the EMAS system currently installed for this runway, neither the design aircraft nor the fleet mix for this runway justify the use of higher strength EMAS blocks. This is due to the fact that in order to limit potential structural damage to the aircraft that typically use this runway, the design of the EMAS would need to be changed, likely requiring an EMAS that would be longer than the existing 60 psi strength block design. Therefore, it would not be possible to replace the existing EMAS bed with 80 psi strength blocks and retain the current configuration.

Runway 22R Alternative 4 – Inclined Safety Area

Description of Alternative

While the existing EMAS bed added significant benefits in aircraft arrestment, there still exists a substantial grade separation between the end of the runway and the Boston Harbor environment, which could inhibit efficient and safe rescue access.

This alternative would enhance the existing RSA by installing an inclined safety area at the end of Runway 22R, similar to the inclined safety areas previously installed at the end of Runways 22L and 27. For this alternative, gravel fill would be placed approximately 190 feet north from the existing EMAS bed and would be graded over

89 Vanasse Hangen Brustlin, *Alternatives Feasibility Study Technical Report, Boston Logan International, East Boston, Massachusetts*, September, 2007.

the full width of the extended safety area down to the mean lower low water elevation.[90] Emergency access ramps would not be required because the inclined safety area would provide first responders with access between the water and the airfield. The perimeter road would not be relocated. Figure 3-9 depicts the inclined safety area alternative.

The inclined safety area would not increase the arrestment speed of the existing 60 psi strength EMAS bed, which currently meets the current minimum FAA Design Standards for overrun protection for the design aircraft (Boeing 757-200), but would provide a smoother transition into the water for any aircraft that exits the runway at a speed greater than 40 knots. There is a substantial elevation change and slope gradient from the end of the existing EMAS bed down to the mean low water elevation. An inclined safety area would re-grade this area to provide a more constant slope in the event that the aircraft exited the EMAS bed and entered the water, and would potentially reduce the potential for loss of life and damage to any aircraft that fails stop within the existing EMAS bed. It would also significantly enhance access by rescue personnel.

Results of Alternatives Screening

The cost to construct the inclined safety area is estimated to be $1.36 million.[91] The cost estimate does not include the cost of mitigation. The cost estimate is below the FAA's maximum feasibility cost for RSA improvement ($8 million with an EMAS bed having a 40-knot arrestment speed), even when combined with the actual cost of the EMAS bed already installed at the Runway 22R end ($3.4 million).

Conclusion

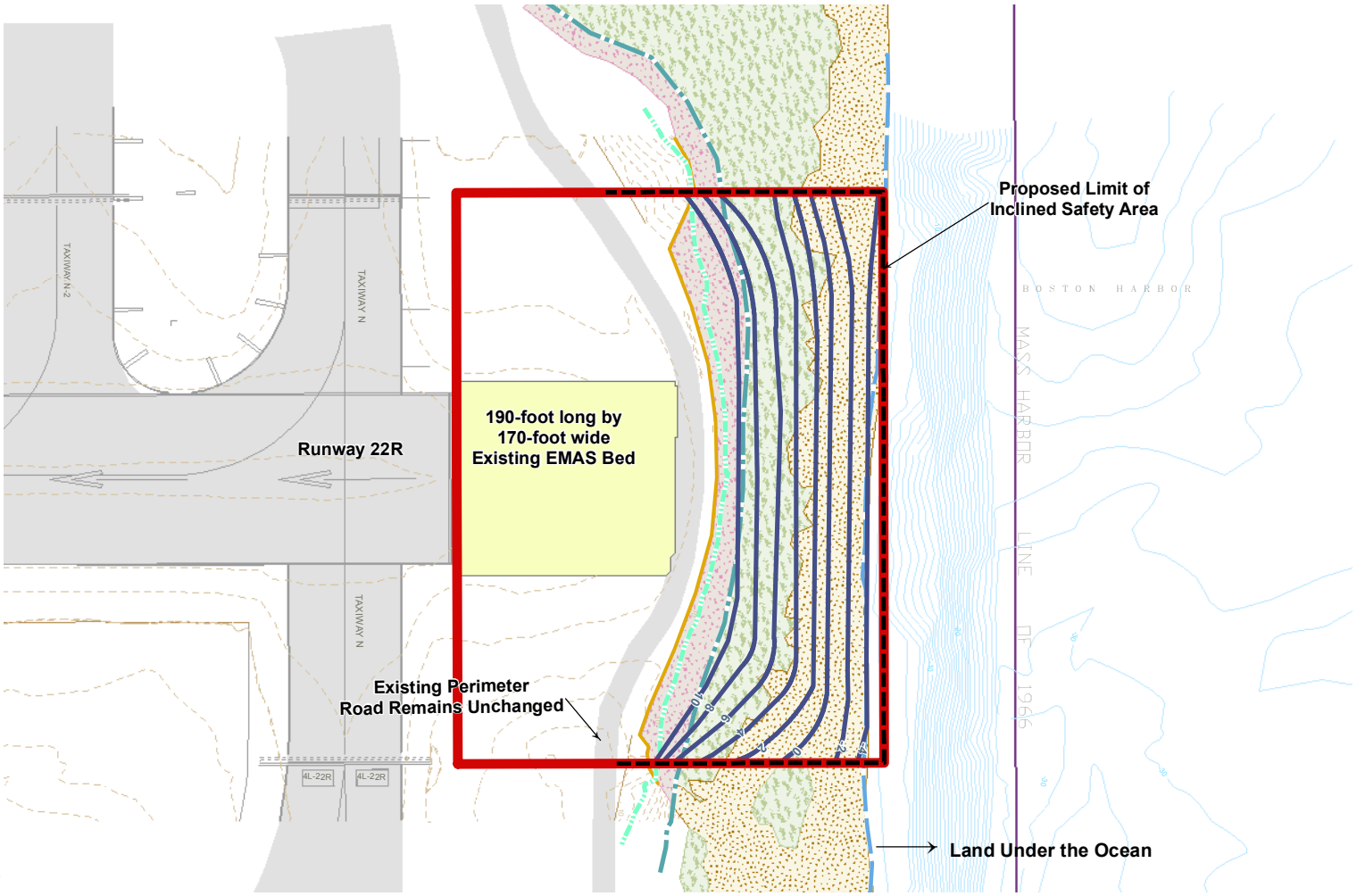
Massport and FAA have retained this alternative for further analysis because constructing an inclined safety area would enhance the existing RSA, and enhance rescue access in the event of an emergency, at a construction cost which appears to be feasible.

3.2.2.3 Runway 22R No-Action Alternative

This alternative assumes that Runway 22R RSA enhancements would not occur. As required by NEPA and MEPA, the No-Action Alternative (No-Build) will be used as the baseline to evaluate the environmental impacts of the alternatives carried forward for analysis in the Draft EA/ EIR. In accordance with the requirements of NEPA and MEPA, Massport and FAA have retained this alternative for further analysis for comparative purposes only within the environmental review process.

90 Mean Lower Low Water (MLLW) = the average daily lower low water level of the tide at a location. Some locations have diurnal tides--one high tide and one low tide per day. At most locations, there are semidiurnal tides--the tide cycles through a high and low twice each day, with one of the two high tides being higher than the other and one of the two low tides being lower than the other.

91 Vanasse Hangen Brustlin, *Alternatives Feasibility Study Technical Report, Boston Logan International, East Boston, Massachusetts*, September, 2007.



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0 150 Feet

Legend

- Existing EMAS Bed
- RSA Footprint
- Limit of Inclined Safety Area
- Proposed Contour
- Coastal Bank
- Coastal Beach
- Salt Marsh
- Existing Contour
- Existing Bathymetric Contour
- Mean High Water (4.58')
- Mean Low Water (-4.51')
- Top of Coastal Bank
- Limit of Land Subject to Coastal Storm Flowage

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Figure 3-9

Runway 22R Alternative 4 Inclined Safety Area

Source: Jacobs Edwards & Kelcey, Inc.
Childs Engineering Corps.
Massport - Bathymetric Contours

3.3 Summary of Alternatives Analysis

This section summarizes the results of the alternatives analysis.

3.3.1 Runway 33L

The following alternatives for the Runway 33L RSA have been eliminated and will not be analyzed in the Draft EA/ EIR:

- Runway 33L Candidate Alternative 1 – Shorten Runway 15R-33L
- Runway 33L Candidate Alternative 2 – Shift Runway Thresholds
- Runway 33L Candidate Alternative 3 – Shift Runway Thresholds in Combination with RSA Enhancement
- Runway 33L Candidate/ Preliminary Alternative 1 - Full 1,000-Foot Long RSA
- Runway 33L Preliminary Alternative 2 – 600-Foot Long and 500-Foot Wide RSA with EMAS
- Runway 33L Preliminary Alternative 3 – 600-Foot Long and 400-Foot Wide RSA with EMAS

Two alternatives for the Runway 33L RSA will continue to be evaluated by Massport and FAA and will be subject of detailed analysis in the Draft EA/ EIR:

- Runway 33L Preliminary Alternative 4 – 600-Foot Long and 300-Foot Wide RSA with EMAS on Pile-Supported Deck
- Runway 33L No-Action Alternative

Runway 33L Preliminary Alternative 4 - 600-Foot Long and 300-Foot Wide RSA with EMAS on Pile-Supported Deck is Massport's and FAA's proposed action. This alternative was selected because, although it would not fully comply with the current design criteria in the FAA's Airport Design Advisory Circular for RSAs[92] in terms of width, it would maintain runway utility and capacity, and would provide protection and functionality near equivalent to a RSA that meets the design criteria.[93] It would do so at a reduced cost and with reduced impacts to environmental resources in Boston Harbor compared to the other alternatives considered. It was also the alternative proposed by the FAA in their determination based on environmental impacts and cost. The FAA stated in their determination that because overrun protection relies upon the 170-foot wide EMAS bed, the probability that an overrun event would be affected by reduction in the width of the RSA is very remote. It will be advanced to a 30 percent level of design and the environmental impact of the alternative will be analyzed in the Draft EA/ EIR. In accordance with the requirements of NEPA and MEPA, the Runway 33L No-Action Alternative will be retained for comparative purposes within the ensuing environmental review process.

92 United States Department of Transportation, Federal Aviation Administration, *Advisory Circular (AC) 150/5300-13, Airport Design, Changes 1 through 13,* June 19, 2008.
93 Federal Aviation Administration, *Runway Safety Area Determination: Runway 15R-33L General Edward Lawrence Logan International Airport East Boston, Massachusetts*, p. 6.

3.3.2 Runway 22R

The following alternatives for the Runway 22R RSA have been eliminated and will not be analyzed in the Draft EA/ EIR:

- Runway 22R Alternative 1 – EMAS Enhancement on Solid Fill
- Runway 22R Alternative 2 – EMAS Enhancement on a Pile-Supported Deck
- Runway 22R Alternative 3 – EMAS Replacement Using 80 psi Strength Blocks in Current Configuration

Runway 22R Alternative 4 - Inclined Safety Area is Massport's and FAA's proposed action. Massport and FAA selected this alternative because constructing an inclined safety area would enhance the existing RSA, and enhance rescue access in the event of an emergency, at a construction cost which appears to be feasible. The alternative will be advanced to a 30 percent level of design and the environmental impacts will be evaluated in the Draft EA/ EIR. In accordance with the requirements of NEPA and MEPA, the Runway 22R No-Action Alternative will be retained for comparative purposes within the ensuing environmental review process.

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Runway Safety Area Improvements Project

4

Description of Environmental Resources, Impacts, and Permits Required

This chapter describes the existing environmental conditions at the ends of Runway 33L and Runway 22R, and addresses environmental resources that could potentially be affected, or that would not be affected, by the proposed RSA enhancements. This chapter also identifies the regulatory permits required for the proposed enhancements.

4.1 Runway 33L

This section describes the existing environmental conditions and anticipated direct, indirect, and construction-period impacts associated with the proposed RSA enhancements for Runway 33L, based on conceptual design.

4.1.1 Existing Conditions

This section describes the existing environmental resources in the vicinity of the proposed RSA enhancements for Runway 33L.

4.1.1.1 Marine Resources

Portions of the proposed Runway 33L RSA enhancement will occur within Coastal Bank, Coastal Beach, Land Containing Shellfish, and Land Under the Ocean (Figure 3-1), as defined by Massachusetts Wetlands Protection Act (WPA) regulations (310 CMR 10.00 et seq.). Portions of this area are also subject to WPA regulations as Land Subject to Tidal Action and Land Subject to Coastal Storm Flowage. Because the Coastal Bank is placed stone, it does not supply sediment and is significant only to storm damage prevention.

An existing timber pier that supports the approach lighting system for Runway 33L arrivals extends from the Coastal Bank approximately 2,400 feet into Boston Harbor. West of the pier, several large boulder groins form the upper substrate portion of this high energy environment. Large boulder placed rip-rap is also east of the

pier along the upper Coastal Bank, and concrete has been poured over the boulders and cobble-sized stones to help stabilize the slope.

Below the riprap and groins, the Coastal Beach is composed of cobbles over gravel and silty sand, and extends down to the mean low water line (Figure 3-1). Some of the cobbles remain from the recovery effort in 1984 to salvage the World Airways aircraft that crashed at this location. Land Under the Ocean extends seaward from the mean low water line, and consists of sand and silt in varying combinations with no evidence of gravel. Sediment samples were collected at the end of Runway 33L in August and October, 2007. In general, the area of Land Under the Ocean in deeper waters contains more silt than sand, while the area in shallower waters contains more sand than silt.[94]

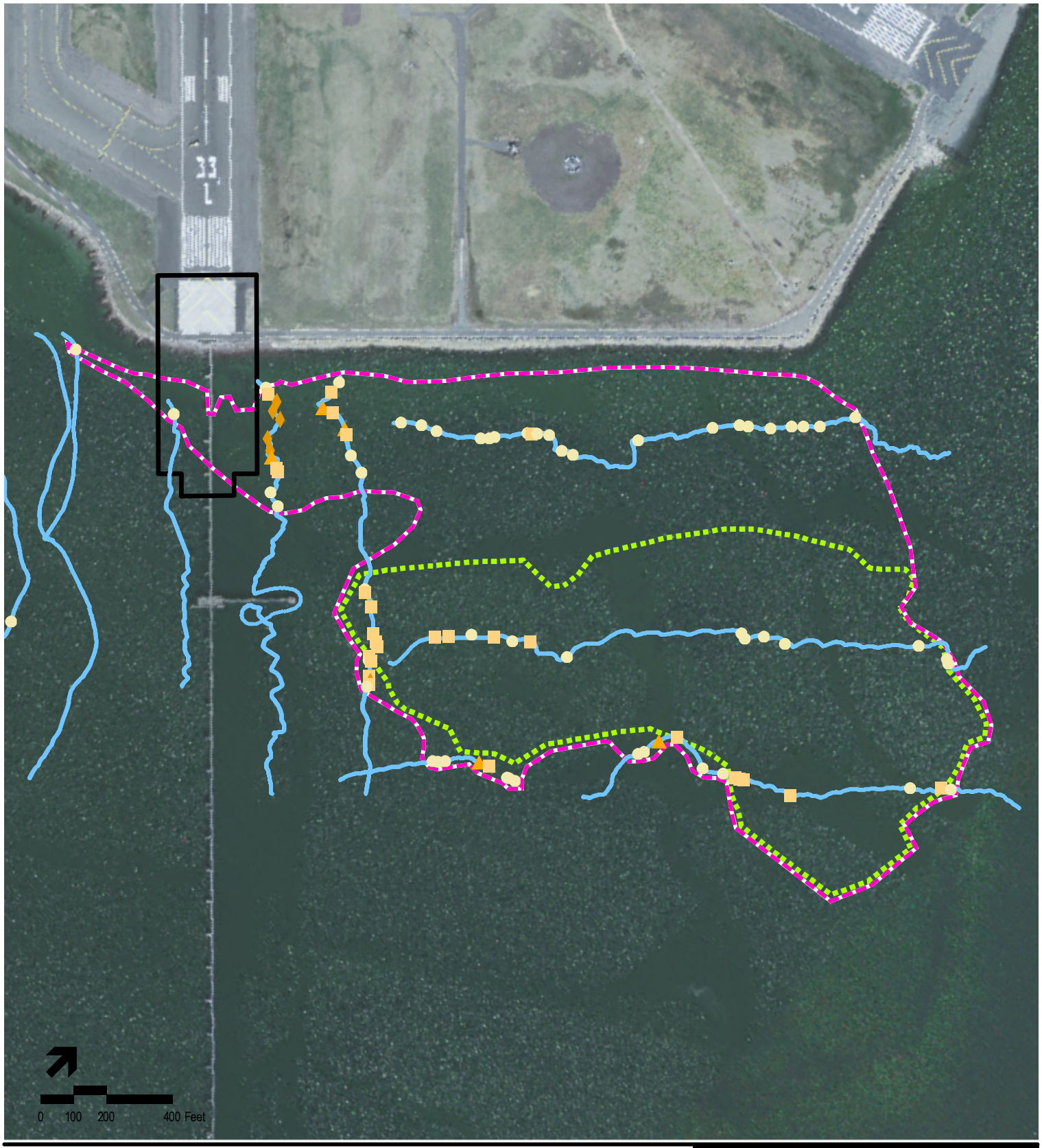
Blue mussels (*Mytilus edulis*) and soft shell clams (*Mya arenaria*) are present off Runway 33L (refer to Section 4.1.1.2 of this ENF for details). There are no vegetated wetlands (Salt Marsh) present at the end of Runway 33L. An eelgrass (*Zostra marina)* bed (Submerged Aquatic Vegetation) is located at the end of Runway 33L. Field surveys were conducted on October 15, 2007 and April 8, 2008 to map the extent of the eelgrass bed. A total of nine underwater video transects were conducted during the survey on October 15, 2007 to determine the extent and density of the eelgrass bed. On April 8, 2008 the landward edge of the eelgrass bed was mapped using a global positioning system (GPS). The surveys show that the eelgrass bed covers an area of approximately 54 acres. As shown on Figure 4-1, the eelgrass bed is primarily on the east side of the Runway 33L light pier. In this area, the boundary of the eelgrass bed extends from approximately 70 to 1,700 feet from the shoreline (measured from the top of Coastal Bank), and approximately 2,400 feet east of the light pier. The eelgrass bed also extends west of the light pier and is approximately 90 to 370 feet from the shoreline (measured from the top of Coastal Bank), and approximately 425 feet west from the light pier.[95] The density of eelgrass is greatest in the area near the shoreline (61 to 100 percent) and further off shore (21 to 60 percent) east of the Runway 33L light pier. Figure 4-1 shows that the boundary of the eelgrass bed identified during the field surveys encompasses the area previously defined by the Massachusetts Department of Environmental Protection (DEP) (2001 MassGIS data).

4.1.1.2 Fish and Shellfish

In conformance with the 1996 amendments to the Magnuson-Stevens Fishery Management and Conservation Act, the National Marine Fisheries Service (NMFS) has designated Essential Fish Habitat (EFH) within marine, estuarine and freshwaters of the U.S. that includes Boston Harbor. Designated EFH is defined as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." Within Boston Harbor, EFH has been designated for one or more life stages of 18 species of fish. Species are as follows: Atlantic cod *(Gadus morhua),* haddock *(Melanogrammus aeglefinus),* pollock *(Pollachius virens),* whiting *(Merluccius bilinearis),* red hake *(Urophycis chuss),* white hake *(Urophycis tenuis),* winter flounder *(Pleuronectes americanus),* yellowtail

94 Vanasse Hangen Brustlin, Sediment Grain-Size Analysis Draft Technical Memorandum, Boston Logan International Airport, East Boston, Massachusetts, September 19, 2008.
95 Vanasse Hangen Brustlin, Eelgrass Survey Draft Technical Memorandum, Boston Logan International Airport, East Boston, Massachusetts, September 26, 2008.

\\mawatr\ev\09980.00\GIS\project\ENF-2009\LoganRSA_33L_Eelgrass_results.mxd



Legend

- Footprint for Runway 33L Prelminary Alternative 4
- Limit of Eelgrass Bed (June 2008)
- MassGIS Eelgrass Bed (2001)
- Video Transects

Percent Eelgrass Cover (Visual Estimate)

- 1% - 20%
- 21% - 40%
- 41% - 60%
- 61% - 100%

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LOGAN AIRPORT RSA
Runway Safety Area Improvements Project

L o g a n R S A

Figure 4-1

Runway 33L - Eelgrass Survey

Data Sources:
CR Enviornmental, Inc.
USGS Digital Raster Graphic (DRG) Boston North - Office of Geographic and Environmental Information (MassGIS)

flounder *(Pleuronectes ferruginea)*, windowpane flounder *(Scopthalmus aquosus)*, American plaice *(Hippoglossoides platessoides)*, ocean pout *(Macrozoarces americanus)*, Atlantic halibut *(Hippoglossus hippoglossus)*, Atlantic sea herring *(Clupea harengus)*, bluefish *(Pomatomus saltatrix)*, long finned squid *(Loligo pealei)*, short finned squid *(Illex illecebrosus)*, Atlantic butterfish *(Peprilus triacanthus)*, and Atlantic mackerel *(Scomber scombrus)*.

Coordination was conducted with the Massachusetts Division of Marine Fisheries (DMF) to identify fish and shellfish species that may be found in the vicinity of the proposed RSA enhancements. The response received from the DMF stated that the mudflats surrounding Logan Airport provide habitat for soft shell clams (*Mya arenaria*) and blue mussels (*Mytilus edulis*), which are commercially and recreationally important species of shellfish. Near-shore areas of Boston Harbor provide habitat for winter flounder (*Pleuronectes americanus*), a recreationally and commercially significant fish in New England waters, and for Alewives (*Alosa pseudoharengus*), blueblack herring (*Alosa aestivalis*), and rainbow smelt (*Osmerus mordax*). DMF also stated that Logan Airport has important habitat resources, including eelgrass beds (refer to Section 4.1.1.1 of this narrative).[96]

A shellfish field survey was conducted off the end of Runway 33L on April 8, June 5 and June 6, 2008. Blue mussels (*Mytilus edulis*) were found in high densities in several areas. A large and densely populated mussel bed is located on the Coastal Beach/ Tidal Flat east of the Runway 33L light pier and additional mussel resources are located above the Coastal Beach/ Tidal Flat area interspersed within the rocky beach slope (Figure 4-1). The mussel bed on the Coastal Beach/ Tidal Flat consists of a dense but patchy bed of live blue mussels attached to a substrate of dead shell and trapped mud that is raised above the flat. Mussels occur at a density of 420 per square meter in this area. Mussels occur at a density of 200 per square meter in the rocky intertidal zone west of the Runway 33L light pier. During the field survey, a small number of live soft shell clams were observed in the Coastal Beach/ Tidal Flat areas off the end of Runway 33L. Based on numbers recovered, densities of soft shell clams are estimated at 9.3 per square meter.[97]

4.1.1.3 Protected Species

Review of the Massachusetts Natural Heritage Atlas indicates there is Priority Habitat in the Runway 33L RSA study area (Figure 4-2). Upland sandpiper (*Bartramia longicauda*), which is listed as endangered in Massachusetts, is known to occur in the large grassy uplands in the interior of the airfield.

Massport has also coordinated with the U.S. Fish and Wildlife Service (USFWS), NMFS, and the Massachusetts Division of Marine Fisheries (DMF) to identify other protected species that may be found in the vicinity of the proposed RSA enhancements. The response received from the USFWS stated that there are no federally-listed or

96 Letter received from the Commonwealth of Massachusetts, Division of Marine Fisheries dated December 4, 2007.
97 Vanasse Hangen Brustlin, Wetland Delineation and Shellfish Survey Results Draft Technical Memorandum, Boston Logan International Airport, East Boston, Massachusetts, September 19, 2008.

\\mawatr\ev\09980.00\GIS\project\ENF-2009\ENL_CH4_LoganRSA_Habitat.mxd

Legend

NHESP Priority Habitats of Rare Species

RSA Enhancement Study Area

0 650 1,300 2,600 Feet

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LOGAN AIRPORT RSA
Runway Safety Area Improvement Project

Logan RSA

Figure 4-2

Priority and Estimated Habitat of Rare Species

Data Sources:
Jacobs Edwards & Kelcey, Inc.
Childs Engineering Corps.
Office of Geographic and Environmental Information (2008)
2008 Aerial Photography (MassGIS)

proposed, threatened or endangered species or critical habitat under its jurisdiction within the Runway 33L project area.[98]

4.1.2 Resources Potentially Impacted

The proposed RSA enhancements for Runway 33L could potentially have direct or indirect, short- or long-term impacts to coastal wetland resource areas, aquatic habitat, coastal processes, and water quality as described below.

4.1.2.1 Direct Impacts

The proposed RSA enhancements, as described in Chapter 3 of this ENF, would result in the loss of coastal wetland resources. However, with selection of the pile-supported deck as the preferred construction technique, direct impacts to these resources have been avoided or minimized the maximum extent practicable while still meeting the project purpose and need.

Runway 33L Preliminary Alternative 4 would result in impacts to the following coastal wetland resources and intertidal and benthic community habitat:

- Coastal Bank – Portions of the Coastal Bank would be replaced by the pile-supported deck structure. Approximately 315 linear feet would be impacted.
- Coastal Beach – Approximately 27,550 square feet of Coastal Beach would be located beneath the pile-supported deck. However, Coastal Beach would be lost only where pilings are installed beneath the deck.
- Land Under the Ocean – Approximately 95,530 square feet of land Under the Ocean would be located beneath the pile-supported deck. However, Land Under the Ocean would only be lost where pilings are installed beneath the deck.
- Land Containing Shellfish – Approximately 123,080 square feet of Land Containing Shellfish would be located beneath the pile-supported deck. However, Land Containing Shellfish would only be lost where pilings are installed. The pilings beneath the high water mark would provide substrate for attached and mobile intertidal and subtidal invertebrates including blue mussels.
- Submerged Aquatic Vegetation (eelgrass) - Approximately 55,420 square feet of eelgrass would be located beneath the pile-supported deck. The eelgrass bed would be lost beneath the deck where pilings are installed.

In April 2009, Massport formed an RSA Eelgrass Working Group to focus on issues related to eelgrass impacts at the end of Runway 33L, and mitigation for the impacts. The working group is initially comprised of representatives from the U.S. Environmental Protection Agency (USEPA), DMF, NMFS, DEP, the Massachusetts Office of Coastal Zone Management (CZM), and Massport, who met for the first time on April 17, 2009. The

98 Letter received from the United States Fish and Wildlife Service, New England Field Office dated December 19, 2007.

working group will meet periodically throughout the duration of the project. Issues addressed at this initial meeting included opportunities for early mitigation planning and implementation and the potential use of this resource as a donor bed for Massport and/ or other project eelgrass mitigation.

4.1.2.2 Indirect Impacts

The Runway 33L Preliminary Alternative 4 would result in some changes to coastal processes, though substantially less than either of the filled structures initially considered and rejected. Coastal processes include wave action, tidal circulation, erosion, and sedimentation. Compared to the filled structures, the pile-supported structure would have little to no impact on waves, tidal circulation, and flow. Waves and currents would generally move unimpeded under the pile-supported deck with some reduction in speed due to the presence of the piles. Compared to a filled structure, the pile-supported structure would have less impact on erosion and sedimentation of the harbor bottom and adjacent shoreline. Assuming there is transport of sediment past the site currently, sedimentation may increase slightly beneath the pile-supported structure due to the slight reduction in speed of the currents due to the presence of the piles. Similar to conditions around the existing light pier, a small amount of erosion of the harbor bottom may occur around the piles.

Changes to coastal processes in the vicinity of the pile-supported deck could result in indirect impacts to coastal resources and to benthic organisms, including eelgrass. The pilings could potentially result in a change in form and volume of the Coastal Beach in the area beneath the deck. There could also be a potential change in productivity of Land Containing Shellfish beneath the deck due to a potential change in the distribution of sediment grain size. However, habitat for shellfish would continue to be available as filter feeders and detritivores would not likely be significantly affected.

The small increase in sedimentation that may occur beneath the deck could potentially cover small areas of eelgrass beds in the vicinity. An area beneath the pile-supported structure of approximately 55,420 square feet would be fully blocked from sunlight and therefore would not be able to sustain eelgrass beds, which require light penetration to support photosynthesis. However, eelgrass would still be able to grow in areas beneath the outer edge of the deck that are exposed to sunlight for part of the day.

4.1.2.3 Construction-Period Impacts

Water quality in the vicinity of the proposed RSA enhancement could be temporarily affected by short-term construction activities. Construction activities such as pile-driving could result in a temporary increase in suspended sediments in the area of Boston Harbor in the immediate vicinity of the proposed work. Construction in adjacent upland areas could, in the absence of mitigation, generate sediment from exposed soils, which could temporarily result in short-term increases in suspended solids in the immediate vicinity of the proposed RSA enhancement. Any construction would follow a comprehensive Soil Erosion and Sediment Control Plan to minimize temporary impacts. Installation of piles would avoid impacts associated with dredging to remove unsuitable substrate materials needed for the fill structure options.

Coastal resources and benthic organisms in the immediate vicinity of the proposed RSA enhancement could also be temporarily impacted by short-term construction activities. Barges would be used to construct the deck and install the piles in Boston Harbor. Moving barges to and from the construction site each day, and anchoring the barges in place each day during construction, could impact resources such as eelgrass that are located in the immediate vicinity of the construction site. However, it is anticipated that once construction is complete these resources would begin to recover. Construction would be undertaken in a way that minimizes impacts to resources.

Construction could also result in short-term increases in noise (from construction equipment and pile-driving) and air emissions from construction equipment. However, these increases would be temporary in nature, minor, and far removed from any residential receptors. Massport's established construction mitigation procedures would be followed during construction.

4.1.3 Resources Not Affected

The proposed RSA enhancement to Runway 33L would not result in changes in aircraft operations or runway use. Therefore, the proposed enhancements would not change the Logan Airport's existing or future noise levels or air emissions. With the exception of the construction phase, there would be no increases in vehicular traffic on- or off-airport.

The proposed RSA enhancement would also have no effect on pollutant loading. Pollutant loading from impervious surfaces is dependent on the vehicular traffic and hazardous activities conducted on those surfaces. Without these sources, paved surfaces do not generate total suspended solids or other typical roadway pollutants. Although airports often contain some sources of higher potential pollutant loads, the proposed RSA enhancement would not change any existing potential pollutant sources, introduce any new pollutant sources, or otherwise involve potential pollutant sources. The project would take place in locations that do not generate vehicular pollutant loads and does not propose any new uses in these areas. The construction of the RSA enhancement would not increase vehicular traffic on the perimeter road, would not increase existing operations, and would not increase the risk of spills or other contamination. None of the defined higher pollutant loading sources are present in the areas to be modified. Therefore, the project does not involve any land uses with higher potential pollutant loads and would not affect pollutant loading from Logan Airport.

The proposed RSA enhancement would not extend beyond the existing approach light pier, and would not interfere with recreational or commercial boating within Boston Harbor. There is no public access within the project area due to Logan Airport's legislated security zone. Historical and archaeological resources would not be affected.

4.2 Runway 22R

This section describes the existing environmental conditions and anticipated direct, indirect, and construction-period impacts associated with the proposed RSA enhancement for Runway 22R.

4.2.1 Existing Conditions

This section describes the existing environmental resources in the vicinity of the proposed RSA enhancements for Runway 22R.

4.2.1.1 Wetlands/Marine Resources

Coastal Bank, Salt Marsh, Coastal Beach/ Tidal Flats, Land Containing Shellfish, and Land Under the Ocean as defined by the WPA regulations (310 CMR 10.00 et seq.) were identified in the Runway 22R RSA enhancement study area (Figure 3-6). Portions of this area are also subject to WPA regulations as Land Subject to Tidal Action or Land Subject to Coastal Storm Flowage.

The Coastal Bank at this location is dominated by the invasive common reed (*Phragmites australis*). This area of Coastal Bank is stable and not eroding, and it contributes to the interest of storm damage prevention.

Salt marsh was delineated off the end of Runway 22R on April 8, June 5, and June 6, 2008. Wetlands were identified based on the presence of Salt Marsh grasses (*Spartina alterniflora* and *S. patens*) and common glasswort (*Salicornia europaea*). Salt marsh is located on a peat terrace at the end of Runway 22R that varies in width from 30 feet in the east to 120 feet wide to the west. To the east is a small 30-foot long break in the Salt Marsh fringe along the shoreline and an isolated "island" of Salt Marsh (Figure 3-6). The Salt Marsh consists of typical Salt Marsh grasses (*Spartina alterniflora* and *S. patens*) and common glasswort (*Salicornia europaea*), and appears to be healthy and densely vegetated. The seaward boundary of the Salt Marsh is an abrupt vertical face of the peat mat and is eroding, most likely due to wakes from pleasure boat traffic in the adjacent waterway.[99]

The Coastal Beach/ Tidal Flat consists of silty sand and extends seaward to the mean low water line. Small patches of green algae (*Enteromorpha* sp.) were observed submerged just beyond the low mean water line. Animals observed on the tidal flat and just below mean low water include common periwinkles, eastern mud snails, hermit crabs (*Pagurus longicarpus*), sand shrimp (*Crangon septemspinosa*), and common painted worm (*Nephtys incisa*). Northern rock barnacles and green crab were noted in the intertidal zone. Herring gulls (*Larus argentatus*) were observed foraging along the tidal flats. As described in Section 4.2.1.2 of this narrative, species of shellfish including soft shell clams (*Mya arenaria*) and razor clams (*Ensis directus*) have also been observed on the Tidal Flat surface.

99 Vanasse Hangen Brustlin, Wetland Delineation and Shellfish Survey Results Draft Technical Memorandum, Boston Logan International Airport, East Boston, Massachusetts, September 19, 2008.

Herring gulls, an American oystercatcher (*Haematopus palliates*), and snowy egrets (*Egretta thula*) have been observed foraging on offshore bars near, but not within, the study area.

There are no eelgrass beds at the end of Runway 22R. Eelgrass beds were not observed on the Tidal Flat during field surveys conducted on April 8, June 5, and June 6, 2008 during extreme low water events and eelgrass detritus was not observed washed up on the shoreline at the end of the runway. In addition, no eelgrass was picked up in the grab when sediment samples were collected at the end of Runway 22R. Furthermore, mapping conducted in Boston Harbor by the DEP has not identified the presence of eelgrass beds at the end of Runway 22R.

4.2.1.2 Fish and Shellfish

In conformance with the 1996 amendments to the Magnuson-Stevens Fishery Management and Conservation Act, the NMFS has designated EFH within marine, estuarine and freshwaters of the U.S. that includes Boston Harbor. Designated EFH is defined as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." Within Boston Harbor, EFH has been designated for one or more life stages of 18 species of fish. Species are as follows: Atlantic cod *(Gadus morhua)*, haddock *(Melanogrammus aeglefinus)*, pollock *(Pollachius virens)*, whiting *(Merluccius bilinearis)*, red hake *(Urophycis chuss)*, white hake *(Urophycis tenuis)*, winter flounder *(Pleuronectes americanus)*, yellowtail flounder *(Pleuronectes ferruginea)*, windowpane flounder *(Scopthalmus aquosus)*, American plaice *(Hippoglossoides platessoides)*, ocean pout *(Macrozoarces americanus)*, Atlantic halibut *(Hippoglossus hippoglossus)*, Atlantic sea herring *(Clupea harengus)*, bluefish *(Pomatomus saltatrix)*, long finned squid *(Loligo pealei)*, short finned squid *(Illex illecebrosus)*, Atlantic butterfish *(Peprilus triacanthus)*, and Atlantic mackerel *(Scomber scombrus)*.

Coordination was conducted with the DMF to identify fish and shellfish species that may be found in the vicinity of the proposed RSA enhancements. The response received from the DMF stated that the mudflats surrounding Logan Airport provide habitat for soft shell clams (*Mya arenaria*) and blue mussels (*Mytilus edulis*), which are commercially and recreationally important species of shellfish. Near-shore areas of Boston Harbor provide habitat for winter flounder (*Pleuronectes americanus*), a recreationally and commercially significant fish in New England waters, and for Alewives (*Alosa pseudoharengus*), blueblack herring (*Alosa aestivalis*), and rainbow smelt (*Osmerus mordax*). DMF also stated that Logan Airport has important habitat resources, including Salt Marsh (refer to Section 4.2.1.1 of this narrative).[100]

A shellfish field survey was conducted off the end of Runway 22R on April 8, June 5, and June 6, 2008. No blue mussel beds were observed and live soft shell clams (*Mya arenaria*) were only found in the eastern portion of the Runway 22R study area at an elevation that supported dense Salt Marsh elsewhere in the Runway 22R study area (Figure 3-6). Of the seven live soft shell clams collected in this area, only two market-size individuals (minimum size 2 inches) were observed. Densities of live soft shell clams in this area are estimated at

100 Letter received from the Commonwealth of Massachusetts, Division of Marine Fisheries dated December 4, 2007.

28 per square meter. Substantial numbers of dead soft shell clam shells were also observed throughout the Runway 22R study area during the field survey.[101] Soft shell clams are a commercially and recreationally important species of shellfish, however, given the low densities of live soft shell clams in the Runway 22R study area it has limited recreational and commercial appeal. Active clamming has been observed in areas near the study area, but neither recreational nor commercial clamming has been observed within the study area.

Only one razor clam was collected in the study area and a low-density population of ribbed mussels (*Geukensia demissa*) was observed living within the Salt Marsh.

4.2.1.3 Protected Species

Review of the Massachusetts Natural Heritage and Endangered Species Program (NHESP) Atlas indicates there is no priority habitat in the project study area for Runway 22R (Figure 4-2). Upland sandpiper (*Bartramia longicauda*), which is listed as endangered in Massachusetts, is known to occur in the large grassy uplands in the interior of the airfield.

Data requests have also been sent to the USFWS, NMFS, and the DMF to identify any federally-protected species that may be found in the study area. The response received from the USFWS stated that there are no federally-listed or proposed, threatened or endangered species or critical habitat under its jurisdiction within the Runway 22R project area.[102]

4.2.2 Resources Potentially Impacted

The proposed RSA enhancement for Runway 22R would potentially have direct or indirect, short- or long-term impacts to coastal wetland resource areas, aquatic habitat, and water quality as described below.

4.2.2.1 Direct Impacts

The proposed RSA enhancement, as described in Chapter 3 of this narrative, would result in impacts to coastal wetland resources. Constructing Runway 22R Alternative 4 - Inclined Safety Area would result in impacts to the following coastal wetland resources:

- Coastal Bank – Approximately 530 linear feet (replaced by a filled structure)
- Salt Marsh – Approximately 27,930 square feet
- Coastal Beach – Approximately 35,360 square feet
- Land Under the Ocean – Approximately 4,700 square feet
- Land Containing Shellfish – Approximately 67,990 square feet

101 Vanasse Hangen Brustlin, Wetland Delineation and Shellfish Survey Results Draft Technical Memorandum, Boston Logan International Airport, East Boston, Massachusetts, September 19, 2008.
102 Letter received from the United States Fish and Wildlife Service, New England Field Office dated December 19, 2007.

4.2.2.2 Indirect Impacts

The Runway 22R Alternative 4 - Inclined Safety Area would replace soft Coastal Beach and Salt Marsh with a hard surface, similar to the inclined safety area installed immediately to the east at the end of Runway 22L. Because of its orientation, this is not expected to change wave direction or velocity, or to result in increased erosion or deposition in the marine environment.

4.2.2.3 Construction-Period Impacts

Water quality in the vicinity of the proposed RSA enhancement could be temporarily impacted by short-term construction activities, particularly by dredging to remove unsuitable substrate materials. These activities could result in a temporary increase in suspended sediments the area of Boston Harbor in the immediate vicinity of the proposed work. Construction in adjacent upland areas could generate sediment from exposed soils (in the absence of mitigation), which could temporarily result in short-term increases in suspended solids in the immediate vicinity of the proposed RSA enhancement. Any construction would follow a comprehensive Soil Erosion and Sediment Control Plan to minimize temporary impacts.

Coastal resources and benthic organisms in the immediate vicinity of the proposed RSA enhancement could also be temporarily impacted by short-term construction activities. Construction would be undertaken in a way that minimizes impacts to resources.

Construction could also result in short-term increases in noise (from construction equipment) and air emissions from construction equipment. However, these increases would be temporary in nature and minor. Massport's established construction mitigation procedures would be followed during construction.

4.2.3 Resources Not Affected

The proposed RSA enhancement to Runway 22R would not result in changes in aircraft operations or runway use and would not change the runway thresholds. Therefore, the proposed enhancements would not change Logan Airport's existing or future noise levels or air emissions. There would be no increases in vehicular traffic on- or off-airport.

The proposed RSA enhancement would also have no effect on pollutant loading. Pollutant loading from impervious surfaces is dependent on the vehicular traffic and hazardous activities conducted on those surfaces. Without these sources, paved surfaces do not generate total suspended solids or other typical roadway pollutants. Although airports often contain some sources of higher potential pollutant loads, the proposed RSA enhancement would not change any existing potential pollutant sources, introduce any new pollutant sources, or otherwise involve potential pollutant sources. The project would take place in locations that do not generate vehicular pollutant loads and does not propose any new uses in these areas. The construction of the RSA enhancement would not increase vehicular traffic on the perimeter road, would not increase existing operations, and would not increase the risk of spills or other contamination. In addition, the inclined safety area could not be driven on. None of the defined higher pollutant loading sources are present in the areas to be modified.

Therefore, the project does not involve any land uses with higher potential pollutant loads and would not affect pollutant loading from Logan Airport.

The proposed RSA enhancement would not extend further into the channel than the existing low water line and would not interfere with recreational or commercial boating use in Boston Harbor. There is no public access within the project area due to Logan Airport's legislated security zone. Historical and archaeological resources would not be affected.

4.3 Permits Required

A number of local, state, and federal permits would be needed for the proposed RSA enhancements. Permitting for both the Runway 33L and Runway 22R RSA enhancements would be similar since generally the same resources would be impacted. The Runway 33L and Runway 22R RSA enhancements could be permitted separately since each is a single and complete project that would be constructed independently of the other and possibly at different times.

4.3.1 Massachusetts Wetlands Protection Act – Order of Conditions

Both the proposed RSA enhancements for Runway 33L and Runway 22R would require work within the jurisdiction of the Massachusetts WPA, as both would affect Coastal Bank, land within 100 feet of Coastal Bank, and Coastal Beach.

The proposed RSA enhancement for Runway 33L would require filing a Notice of Intent with the Boston Conservation Commission to obtain an Order of Conditions pursuant to the WPA. No Salt Marsh is in the vicinity of the Runway 33L study area, but the proposed work would have direct or indirect impacts on Submerged Aquatic Vegetation (eelgrass) and does not comply with the performance standards at 310 CMR 10.25(6), which stipulate that non-water-dependent work may not have an adverse effect on marine fisheries habitat caused by destruction of eelgrass beds. Approximately 55,420 square feet of eelgrass would be impacted. Massport anticipates that the proposed RSA enhancements can be designed and constructed (with appropriate mitigation) so as to meet all other WPA regulatory performance standards for these resource areas.

The proposed RSA enhancement for Runway 22R would require filing a Notice of Intent with the Boston Conservation Commission to obtain an Order of Conditions pursuant to the WPA. Approximately 27,930 square feet of Salt Marsh would be impacted by construction of the inclined safety area. WPA regulations (310 CMR 10.32(2)) prohibit any alteration of Salt Marsh or marine fisheries habitat unless a Variance is issued by the Commissioner of the DEP. A Variance would be required for the proposed RSA enhancements for both Runway 33L and 22R. The requirements for a Variance (310 CMR 10.05(10)) are that:

- There are no reasonable conditions or alternatives that would allow the project to proceed in compliance with the regulations;
- Mitigating measures are proposed that would allow the project to be conditioned so as to contribute to the protection of the interests of the Act; and
- The variance is necessary to accommodate an overriding community, regional, state, or national public interest.

As documented in Section 3.1.2 of this ENF, there are no reasonable alternatives that would allow the existing RSA for Runway 33L to be enhanced in compliance with the regulations, as the eelgrass bed is located in close proximity to the end of the runway. There are also no reasonable alternatives (refer to Section 3.2.2) that would allow the existing RSA for Runway 22R to be enhanced in compliance with the regulations, as the Salt Marsh is located at the base of the Coastal Bank in close proximity to the existing runway end. Mitigation measures will be fully developed and presented in the Draft EA/ EIR. As demonstrated in Section 2.3 of this ENF, the proposed RSA enhancements for both Runway 33L and 22R are necessary to accommodate an overriding public/ safety interest.[103]

4.3.2 Section 10/Section 404

Both the proposed RSA enhancements for Runway 33L and Runway 22R would require fill materials to be placed below the extreme high water line[104] and therefore would both require an Individual Section 10/ 404 permit from the U.S. Army Corps of Engineers (USACE). The authority for these permits is Section 10 of the Rivers and Harbors Act for any structures or work within tidal waters up to mean high water and Section 404 of the Clean Water Act for placing fill or dredged material up to the extreme high water line or within adjacent wetlands.

Constructing the inclined safety area at the end of Runway 22R would adversely affect Salt Marsh, defined as a "Special Aquatic Site" by the Clean Water Act regulations under the Section 404(b)(1) Guidelines, and therefore must meet the requirements of these Guidelines, which state that "no discharge of fill shall be permitted if there is a practicable alternative to the proposed discharge which would have less adverse impact on the aquatic ecosystem." Eelgrass beds (vegetated shallows), which would be impacted by the RSA enhancement at the end of Runway 33L, are also defined as a Special Aquatic Site under the Clean Water Act.

Prerequisites for the USACE issuance of a permit are the Section 401 Water Quality Certificate issued by the DEP and a Coastal Zone Consistency Statement from the Massachusetts Coastal Zone Management Program.

Review will be coordinated with other federal and state review agencies including the U.S. Environmental Protection Agency, the USFWS, the NMFS, and the DEP.

103 The findings of the Variance previously issued by the DEP for the inclined safety area at the end of Runway 22L stated that the inclined safety area was necessary to accommodate an overriding public/safety interest.
104 Extreme high water is the highest annual tide level reached in a given location. This includes the combined effects of tidal forces and storm surges.

4.3.3 Water Quality Certification

Water Quality Certification is required from the state under Section 401 of the Clean Water Act to demonstrate that a permit issued by the USACE would not violate state water quality standards. This permit cannot be issued until a final Order of Conditions is issued by the Boston Conservation Commission or DEP.

State water quality standards contained in 314 CMR 9.00 and 314 CMR 4.00 would apply to the dredging that would be necessary to remove unsuitable substrate at the Runway 22R end, as well as to the potential temporary construction-period increases in sedimentation and turbidity from the construction activities at the ends of both the Runway 22R and 33L. As indicated in Sections 4.1.3 and 4.2.3, the proposed RSA enhancements for Runway 33L and Runway 22R would not increase the pollutant loading to Boston Harbor and would be designed to comply with applicable Stormwater Policy Standards.

4.3.4 Chapter 91

Those portions of the proposed RSA enhancements seaward of the mean high water line would require a Chapter 91 license. Massport believes that these areas can be designed and constructed in compliance with the applicable regulatory standards and that the proposed RSA enhancements serve a public purpose by enhancing aviation safety.

For those portions of the project within Chapter 91 jurisdiction, the waterways regulations at 310 CMR 9.05 require the DEP to issue a license for any construction within tidelands, after considering a project's impacts on the preservation of rights held by the Commonwealth in trust for the public. The regulations at 310 CMR 9.31 establish two general standards for any Chapter 91 license:

- The project must meet the basic requirements listed in 310 CMR 9.31(1); and
- The project must serve a proper public purpose.

The areas in which work is proposed are not currently accessible to the public and would not be accessible to the public for the foreseeable future. These areas are within the state-legislated Logan Airport security zone restrictions on public access. This security zone extends 500 feet seaward of the high water mark. Therefore, the proposed RSA enhancements would not interfere with or restrict any water-related public rights of access.

4.3.5 Coastal Zone Management Consistency

As discussed above, the USACE authorization would require an approved Coastal Zone Management Consistency Statement demonstrating consistency of the proposed RSA enhancements with the Massachusetts Office of Coastal Zone Management Policies. Massport believes that the RSA enhancements for both Runway 33L and Runway 22R can be designed and constructed to be consistent with all of the CZM Program Policies as set forth in 301 CMR 21.00. The Draft EA/ EIR will provide a draft Consistency Evaluation.

4.3.6 Other Permits and Approvals

The proposed RSA enhancements for Runway 33L and Runway 22R would also require completion and submittal of a Stormwater Notice of Intent to the USEPA for coverage under the National Pollutant Discharge Elimination System (NPDES) Construction General Permit for stormwater discharge from construction activities, and FAA will also need to approve any modifications to the Airport Layout Plan.

LOGAN AIRPORT RSA
Runway Safety Area Improvements Project

5

Proposed Scope for the Draft EA/EIR

As described in Section 1.4, Massport plans to prepare a combined Draft EA/ EIR to meet the requirements of both the National Environmental Policy Act (NEPA) and the Massachusetts Environmental Policy Act (MEPA). This chapter provides a proposed scope for that document.

5.1 Summary

A summary will be included in the Draft EA/ EIR that adequately and accurately summarizes the document. The summary will contain the following:

- The name and location of the project, including the Executive Office of Energy and Environmental Affairs (EEA) File Number;
- A brief description of the project, including the purpose of and need for the project, and the alternatives considered. The description will identify any changes made to the Project since completion of the ENF.
- A summary of the potential environmental impacts of the project.
- A list of any land transfer, permit, license, certificate, variance, approval, or financial assistance required for the project.
- A list of project mitigation measures.

5.2 Purpose and Need

The Draft EA/ EIR will specify the underlying purpose and need to which Massport and FAA are responding in proposing the RSA enhancements to Runway 33L and 22R.

5.3 Project Description/Alternatives

MEPA and NEPA both require a proponent to evaluate practicable alternatives to a proposed project to ensure that all feasible means to avoid, minimize, or mitigate environmental damage have been considered. Based on the alternatives analysis presented in the ENF, Massport recommends that the alternatives listed below be described and evaluated in the Draft EA/ EIR. For each alternative examined in detail in the Draft EA/ EIR, the document will describe:

- The location and extent of the proposed RSA enhancements, including overall dimensions and elevations, illustrated with a location map and site plan at an appropriate scale and level of detail.
- Modifications to other structures at the runway ends, including runway navaids and the existing perimeter road.
- Measures incorporated into the design to avoid and minimize environmental impacts, including shoreline protection measures.

5.3.1 Runway Safety Area Enhancement Alternatives for Runway 33L

The alternatives analysis presented in the ENF evaluated a range of potential alternatives for enhancing the RSA at the end of Runway 33L (refer to Section 3.2.1 of the ENF) and together with FAA, Massport determined that the majority of potential alternatives are not reasonable and feasible. Massport therefore proposes to summarize this alternatives analysis in the Draft EA/ EIR and to describe and evaluate in detail one build alternative, the Runway 33L Preliminary Alternative 4 - 600-Foot Long and 300-Foot Wide RSA with EMAS on Pile-Supported Deck. Based upon the results of the alternatives analysis, Massport and FAA have agreed that the 600-foot long and 300-foot wide RSA with EMAS alternative on a pile-supported structure best achieves the project purpose and need, while maintaining runway utility and capacity, and avoiding and/ or minimizing environmental impacts to the maximum extent practicable. It was the alternative proposed by the FAA in their determination based on environmental impacts and cost. The FAA also stated in their determination that because overrun protection relies upon the 170-foot wide EMAS bed, the probability that an overrun event would be affected by reduction in the width of the RSA is very remote.

To document baseline conditions, the Draft EA/ EIR will describe the Runway 33L No-Action Alternative.

5.3.2 Runway Safety Area Enhancement Alternatives for Runway 22R

Massport proposes to summarize the alternatives analysis in the Draft EA/ EIR and to describe and evaluate in detail only one build alternative, Runway 22R Alternative 4 - Inclined Safety Area. To document baseline conditions, the Draft EA/ EIR will describe the Runway 22R No-Action Alternative.

5.4 Existing Environment and Environmental Impacts

The Draft EA/ EIR will describe the existing environment and the environmental impacts of the proposed RSA enhancements.

5.4.1 Wetlands/Marine Resources

The Draft EA/ EIR will identify and map all wetland resource areas by type, including adjacent off-site wetlands that could be adversely affected by the project. The resource maps will include information on wetlands that are subject to federal and state jurisdiction and will be accompanied by a narrative description of each wetland resource area that identifies the significance of its resource values. As detailed in Chapter 4 of this narrative, Massport has already completed some of this work, having identified and delineated wetlands at the end of Runway 22R and identified and mapped Submerged Aquatic Vegetation (eelgrass) at the end of Runway 33L.

The Draft EA/ EIR will quantify all direct impacts to wetland resources associated with proposed RSA enhancements at the Runway 22R and Runway 33L ends, including Salt Marsh, Land Under the Ocean, Coastal Beach, and Coastal Bank, and any potential direct or indirect impacts to adjacent resources such as Land Containing Shellfish or Submerged Aquatic Vegetation. Impacts evaluated will include direct impacts from filling, excavation, dredging, installation of structures, and shadowing by structures.

As detailed in Section 4.1.1.1, Massport has already mapped the extent of Submerged Aquatic Vegetation (eelgrass) at the end of Runway 33L. The potential direct impact to Submerged Aquatic Vegetation, indirect impacts to Submerged Aquatic Vegetation through shading from structures, changes in tidal flows or currents, and erosion or accretion of sediment will be evaluated and identified in the Draft EA/ EIR. In April 2009, understanding that impacts to eelgrass resources are unavoidable, Massport formed an RSA Eelgrass Working Group to focus on issues related to eelgrass impacts at the end of Runway 33L, and mitigation strategies. In addition to Massport and FAA, the working group is initially comprised of representatives from the USEPA, DMF, NMFS, DEP, and CZM and will meet periodically throughout the duration of the project. The Draft EA/ EIR will document this coordination. Due to the dynamic nature of this resource, it is assumed that a second/ final eelgrass mapping would be necessary as the permits are being reviewed to document the area of impact closer to the time of proposed construction.

Impacts to the aquatic environment will be assessed based on the amount of fill, amount of dredging required to remove unsuitable substrate, installation of the structures, amount of area shaded, and the potential indirect effects of changes in water circulation patterns and changes in the erosion or deposition patterns resulting from changes in current speed or wave deflection. Changes to water circulation patterns at the end of Runway 33L will be assessed using a computer simulation model that simulates the currents in the areas around the intrusion into Boston Harbor and adjacent areas. The model will be built on previous hydrological model applications to Boston Harbor and calibrated using field measurements of local currents at the end of the runway and sediment-grain-size analysis in the impact area. Patterns of sediment erosion and deposition will be

calculated from the model, using sediment-grain-size characteristics, wind and tide-induced currents, and bottom velocities to estimate the potential for erosion and deposition in the areas around the airport property.

The proposed RSA enhancements for Runway 22R would alter an area of Salt Marsh (refer to Section 4.2.1.1 of the ENF) and therefore require a Variance under the Wetlands Protection Act regulations. A Variance under the Wetlands Protection Act regulations would also be required for the loss of Submerged Aquatic Vegetation (eelgrass) that would occur as a result of the proposed RSA enhancements to Runway 33L. The Draft EA/ EIR will address the requirements of a Variance, including documenting the public interest met by the proposed enhancements, the absence of other feasible alternatives that would avoid or minimize the impacts, and the mitigation measures proposed to compensate for the loss of Salt Marsh and eelgrass. The proponent will coordinate with the Boston Conservation Commission and DEP during preparation of the Draft EA/ EIR and will document this coordination in the Draft EA/ EIR.

The Draft EA/ EIR will document compliance with the Massachusetts Coastal Zone Management Program Policies, and compliance with the requirements for a Chapter 91 license. The proponent will consult with CZM and DEP during preparation of the Draft EA/ EIR and will document this coordination in the Draft EA/ EIR.

5.4.2 Water Quality

The Draft EA/ EIR will provide a drainage analysis and a detailed description of the proposed stormwater management measures for each runway end and will demonstrate how the projects will meet DEP's Stormwater Management Policy and applicable standards. The Draft EA/ EIR will identify the size and location of stormwater system features and will demonstrate how the proposed RSA enhancements are consistent with Logan Airport's stormwater management practices and the requirements of the NPDES Permit issued for Logan Airport on July 31, 2007.

5.4.3 Fish and Shellfish

The proposed RSA enhancements could potentially affect fish, wildlife, and plant species. Each of the proposed RSA enhancements will be evaluated for benthic communities, fish and shellfish, and essential fish habitat (EFH), and direct and indirect impacts will be identified. Loss of habitat, changes in water quality, or changes to substrate characteristics will be quantified and the impact that will have on the biotic communities will be discussed for each alternative.

Massport has conducted a shellfish survey at the ends of Runways 33L and 22R (refer to Sections 4.1.1.2 and 4.2.1.2). Impacts to shellfish beds at each runway end will be evaluated in consultation with the DMF. The Draft EA/ EIR will document this coordination.

5.4.4 Rare Species

Although the proposed RSA enhancements for Runways 33L and 22R would include work within and adjacent to areas mapped by NHESP as Priority Habitat for grassland bird species, no loss of grassland is anticipated. However, Massport will coordinate with the NHESP to determine if the proposed work would alter the habitat of a protected species, evaluate the effects on the local population, and determine if a Conservation and Management Permit is required for the proposed work. The Draft EA/ EIR will document this coordination.

5.4.5 Construction Impacts

The Draft EA/ EIR will include a draft Construction Management Plan (CMP) describing project activities and their schedule and sequencing for the proposed RSA enhancements at both runway ends. The CMP will include Best Management Practices (BMPs) that would be used to avoid and minimize adverse environmental impacts, and will address potential impacts and mitigation related to land disturbance, wetlands and rare species impacts, noise, dust, vehicle emissions, and construction debris. Massport's construction mitigation guidelines to contractors, as well as construction period mitigation measures employed on other airport projects and FAA's guidance, will form the basis for developing mitigation strategies. The CMP will include a disposal plan for excess construction materials, including dredged material, and will consider on-site recycling. Specific quantitative analysis of short-term construction period impacts will be conducted for noise and air quality as described below.

5.4.5.1 Noise

Noise from construction activities associated with the proposed RSA enhancements for each runway end will be evaluated based on average day-night levels (DNL). DNL values will be estimated based on phasing and usage factors for construction equipment needed during the build-out period for each alternative. Construction noise DNL values will be compared to flight noise for the same time frame, and the resulting exposure levels will be assessed for significance.

5.4.5.2 Air Quality

Since the project will not change how Logan Airport operates, an air quality analysis will not be conducted. However, the Draft EA/ EIR will present an emissions inventory of construction-related emissions associated with the proposed RSA enhancements at each runway end, including emissions from heavy construction equipment, marine vessels including barges and tugs, storage piles of raw materials, and fugitive dust. The emissions inventory will consider carbon monoxide (CO), volatile organic compounds (VOCs), nitrogen oxides (NOx), sulfur oxides (SOx), and particulate matter (PM_{10} and $PM_{2.5}$). The project is not subject to the EEA *Greenhouse Gas (GHG) Emissions Policy* (dated April 23, 2007), and therefore GHGs will not be included in the emissions inventory.

5.4.5.3 Submerged Aquatic Vegetation

The Draft EA/ EIR will assess the impact of construction of the proposed RSA enhancement at Runway 33L on Submerged Aquatic Vegetation. Barges would be used to construct the deck and install the piles in Boston Harbor. In addition to direct project impacts, moving barges to and from the construction site each day,

and anchoring the barges in place each day during construction could temporarily affect resources such as eelgrass that are located in the immediate vicinity of the construction site.

5.5 Cumulative Impacts

The cumulative impact analysis will focus on the Boston Inner Harbor area and will primarily address cumulative impacts to coastal resources. The analysis will assess past losses of Salt Marsh, eelgrass, shellfish beds, and subtidal areas in Boston Harbor as a result of past and reasonably foreseeable future changes to Boston Harbor resulting from construction projects at Logan Airport and surrounding areas, including work by others.

5.6 Mitigation and Section 61 Findings

The Draft EA/ EIR will identify opportunities for mitigation of unavoidable permanent impacts to each resource. Mitigation measures will be identified for each runway end for each of the "build" alternatives considered in the Draft EA/ EIR. This section will also discuss the impacts and mitigation associated with the Preferred Alternative. This will form the basis for the Draft Section 61 Findings as required by MEPA and FAA's findings under NEPA. Draft Section 61 Findings will include identifying proposed mitigation measures, implementation schedule, monitoring measures during construction, and post-construction monitoring. The Draft EA/ EIR will include Draft Section 61 Findings.

5.6.1 Salt Marsh

Constructing any safety improvements including an inclined safety area would require unavoidable loss of Salt Marsh at the Runway 22R end. Measures to minimize impacts will be identified, and measures to compensate for Salt Marsh loss will be developed in consultation with the Boston Conservation Commission, DEP, and the USACE. The Draft EA/ EIR will present the results of this consultation and will identify conceptual locations and designs for compensatory wetland mitigation measures, which may include the restoration of previously filled or degraded Salt Marsh as well as the construction of new Salt Marsh areas. Selection of sites for Salt Marsh mitigation will consider the FAA AC 150/ 5200-33B which provides guidance on land uses that have the potential to attract hazardous wildlife on or near public-use airports.

5.6.2 Submerged Aquatic Vegetation

Constructing a pile-supported deck, while significantly minimizing impacts, would require unavoidable loss of, and indirect impacts to, Submerged Aquatic Vegetation (eelgrass) at the Runway 33L end. Measures to minimize impacts will be identified, and measures to compensate for loss of eelgrass will be developed in consultation with members of the RSA Eelgrass Working Group and their respective agencies. The Draft EA/ EIR will present the results of this consultation and will include a preliminary eelgrass mitigation plan that

identifies suitable mitigation location(s) or other mitigation strategies and describes a program for monitoring the success of mitigation. Selection of sites for mitigation will consider the FAA AC 150/ 5200-33B which provides guidance on land uses that have the potential to attract hazardous wildlife on or near public-use airports.

5.6.3 Shellfish Beds

Impacts to shellfish beds may result from any alternative with in-water construction. To the extent any impacts result, appropriate potential mitigation measures and areas will be identified in the Draft EA/ EIR in consultation with the NMFS, DMF, and the City of Boston.

5.6.4 Water Quality

The Draft EA/ EIR will describe proposed mitigation measures to protect water quality during the construction period.

5.7 Comments

The Draft EA/ EIR will include copies of all comment letters received on the ENF and respond to the comments to the extent that they are within MEPA jurisdiction. The Draft EA/ EIR will present any additional narrative or quantitative analysis necessary to respond to the comments received.

5.8 Distribution

The proponent will circulate the Draft EA/ EIR to all who submitted comments on the ENF, in accordance with Section 11.16 of the MEPA regulations and relevant NEPA regulations, and to those state agencies from which the proponent will seek permits or approvals. Copies will be provided to City of Boston Library branches for public review. Massport will also provide copies of the Draft EA/ EIR to any agency or member of the public that requests a copy. Copies of the Draft EA/ EIR will be available for download on Massport website www.massport.com.

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LOGAN AIRPORT RSA
Runway Safety Area Improvements Project

Appendix A

Runway Safety Area Determination: Runway 15R-33L General Edward Lawrence Logan International Airport East Boston, Massachusetts (January 30, 2009)

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Runway Safety Area Determination: Runway 15R-33L
General Edward Lawrence Logan International Airport
East Boston, Massachusetts

Introduction

This document provides the background and justification for Runway Safety Area (RSA) determination for Runway 15R-33L at Boston-Logan International Airport (BOS). RSA determinations for other runway ends are contained in previously approved documents.

Existing Conditions

Table 1 summarizes existing conditions for Runway 15R-33L. This runway is 10,083 ft. long with 880 ft. displaced threshold on R/W 15, and is 150 ft. wide.

Table 1

	15R	33L
ILS	ILS with Offset Localizer	ILS CAT II
Lowest Minima	267/24 250 (300/½)	116/12 100
RSA Dimension (width x length)	500' x 1,000'	250'L/200'R x 187.5'

Background

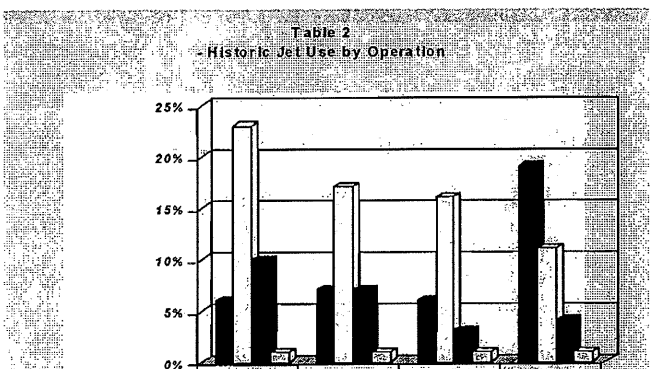
Table 2 presents information regarding recent historic jet activity on this runway[1]. Departures on Runway 33L occur 6% to 19% of the time.

Runway 33L is the preferential night arrival runway, and has a Cat II ILS to support this function. Its overall usage has declined from 23% in 2004 to 11% in 2007.

Runway 15R is the preferred night departure runway for noise mitigation. Its total use for jet departures ranges from 10% to 3% of all jet operations.

Arrivals to 15R occur only in a southeast IFR configuration when this is the only arrival runway that is available due to winds. This occurs about 1% of the year.

Runway 33L departures and arrivals have a standard 1,000' by 500' RSA overrun protection. Runway 15R departures and arrivals only have 200'



	2004	2005	2006	2007
Depart 33L	6%	7%	6%	19%
Arrive 33L	23%	17%	16%	11%
Depart 15R	10%	7%	3%	4%
Arrive 15R	1%	1%	1%	1%

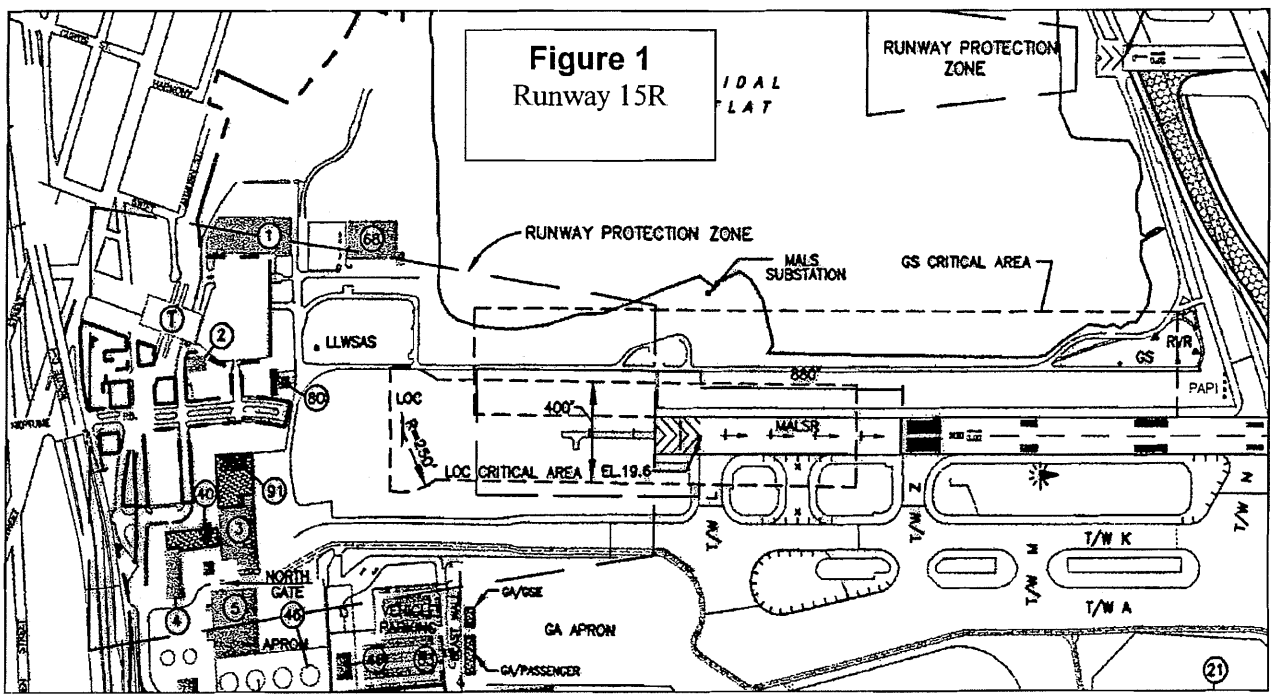
[1] **2007 Environmental Data Report- Boston Logan International Airport**, Massport, EOEA #3247, September 2008, constructed from data in Table 6-4, p 6-16.

of overrun protection with a high risk of catastrophic consequences of an aircraft entering into Boston Harbor. An interim non-standard EMAS bed has been installed by Massport to partially mitigate this hazard. Historically 5% to 11% of jet operations are conducted with this level of RSA protection.

In addition there is inadequate protection for undershoots by aircraft arriving Runway 33L. This comprises another 23% to 11% of jet operations. Evaluated collectively, the deficiency in RSA dimensions outbound of the Runway 33L threshold involves 8% to 17% of jet operations at Logan.[2] In 2007 this represented about 2 million passengers.

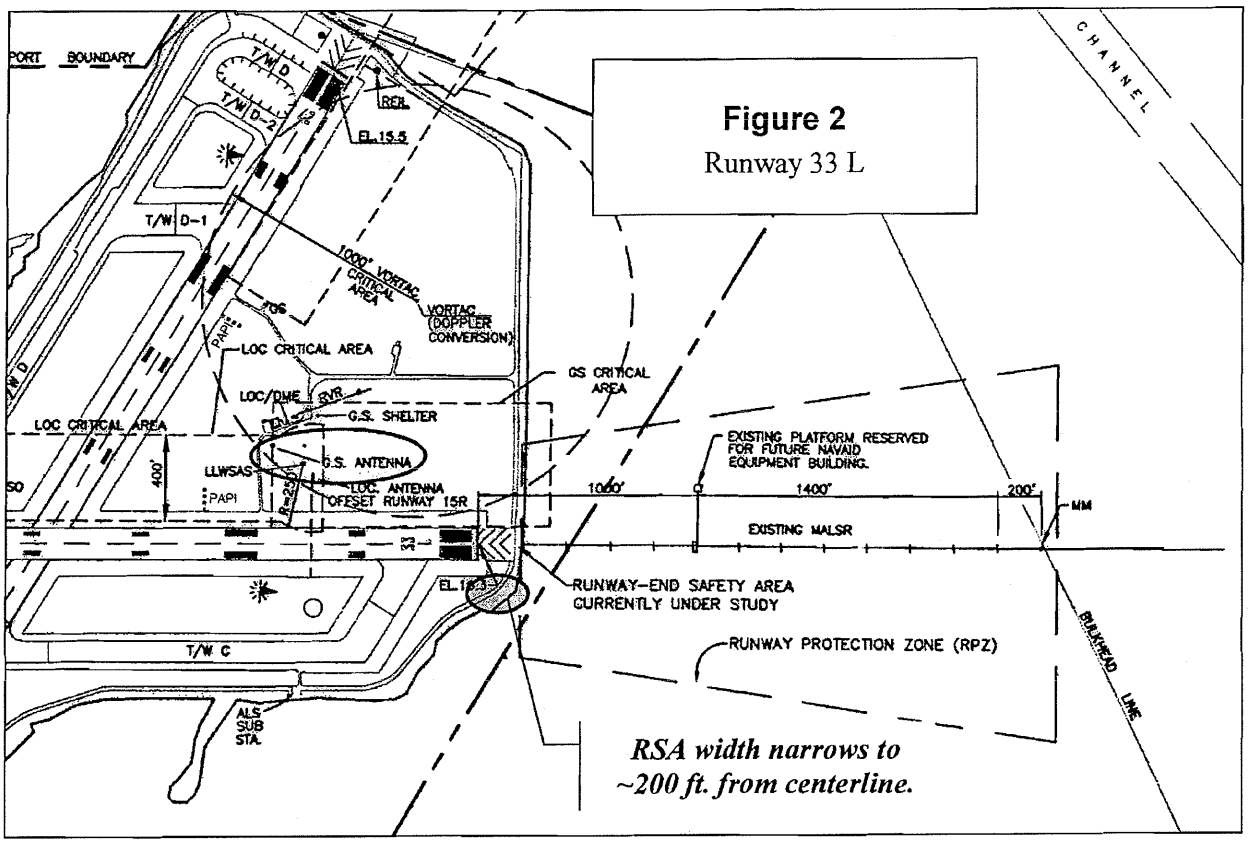
Physical Constraints on Runway Corridor

Northwest of Runway 15R is an elevated highway that imposes the 880' displacement (see Figure 1). There is a high sensitivity of the residential community to any relocation of runway to the northwest. Incompatible uses in runway protection zone, such as the transit station would be closer to the runway end without this displacement.



[2] In 2004, 24% of jet arrived on 15R or 33L and 11% of jets departed 15R, adding and then dividing by two to convert to total operations is equivalent to 17% of all jet operations. Similarly, in 2007, the data in Table Two indicates an equivalent of 8% of total jet operations were at risk from inadequate safety areas beyond the Runway 33L threshold.

The RSA is restricted southeast of Runway 33L (Figure 2) by Boston Harbor immediately beyond the 200' blast pad and perimeter service road. The seawall reduces width below standard to the right (southwesterly) of centerline.



Accident History

1/23/1982- World Airways, DC-10-30, arrival to Runway 15R exited beyond end of Runway 33L and entered harbor. (2 Fatalities, 4 Serious, 24 Minor). (see Attachment A).

The identified cause of this accident was not the Runway Safety Area, though terrain was listed as a contributing factor, particularly to the level of aircraft damage and loss of life that was incurred after a safe touchdown and rollout.

The major cause of this accident was poor braking action on a runway contaminated by snow and ice and the failure to provide the pilot with adequate information on these conditions. In addition the pilot was conducting a VOR approach without vertical guidance, which could have contributed to his landing past the touchdown zone.

Since this accident, many of the factors that were direct causes of the accident have been corrected, primarily updated reporting of current weather conditions, better monitoring of

braking conditions, and navaid enhancements including a precision approach and PAPI's. Consequently the risk of a re-occurrence of a landing overrun accident due to these circumstances has been significantly reduced. However, the consequence of any event resulting in an aircraft operating on 15R overrunning the 33 threshold has been only been partially mitigated by the interim EMAS.

Evaluations

Practical Cost Guidance

The "maximum feasible cost" for improving this runway's RSA is approximately $25 million according to Figure 4 in FAA Order 5200.9, *Financial Feasibility and Equivalency of Runway Safety Area Improvements and Engineered Material Arresting Systems.* Any alternative that exceeds this guidance will be closely evaluated for cost savings. Alternatives will explore opportunities to use non standard design to provide reductions in cost that greatly exceed reductions in performance.

Runway 15R

This runway end is fully compliant with runway safety area dimensions of 500' by 1,000', graded to standards and free of objects not fixed by function.

Runway 33L

The following alternatives were evaluated for providing compliant runway safety area.

1) Create a 500' by 1,000' RSA by reducing runway length by 800' (9,283' total, 8,403' LDA for 15R): Unacceptable due to loss of critical runway length at airport with wide body service on long stage lengths[3]. This runway is the only long runway available in northwest wind conditions and is designated the preferential runway for night operations.

2) Reduce runway length by 400' providing EMAS bed and 600 ft. land short RSA. (9,683' total, 8,803' LDA for 15R.): This was also judged to be an unacceptable loss of runway length. Note that in both of these options, the full safety area width would not be achieved along a portion of the southwesterly side of centerline.

3) Relocate Runway 15R/33L 800' to the northwest, maintaining full length.: Unacceptable for various reasons, including:

[3] Determining critical runway length for passenger air carrier jet service is a very complex exercise. The performance characteristics developed by aircraft manufacturers is only one factor. Trip length, airline operational policies, noise abatement procedures, and obstructions to one-engine-out climb paths combine to defy identification of a common definition of critical length. Massport's technical team has determined that even a 200 foot relocation of Runway 33L would incur 300 to 5,600 in payload penalties due to obstructions to the shifted departure surfaces.

a) It would significantly impact residential communities that already suffer from exposure to high levels of aircraft noise.
b) Runway 33L glide slope would need to be relocated into protected area of Runway 27.
c) This would incur incompatible land uses within the Runway 15R RPZ.
d) This would increase penetrations to the 15R approach surface and the 33L departure surfaces resulting in significant operational penalties.

4) Relocate Runway 15R/33L 400' to the northwest to provide 600' RSA and EMAS beyond the 33L threshold: Rejected for all of the same reasons as Alternative 3.

5) Relocate Runaway 15R/33L 200' to the northwest in combination with extension of RSA into Boston Harbor: Due to the high costs of construction in the harbor, this alternative was given careful analysis for its potential to provide cost savings. While the glideslope for 33L arrivals would remain outside of the runway 9/27 protected surfaces, it would have to be carefully evaluated for the impact of the 15R localizer and associated facilities within the glideslope critical area. However due to obstructions to Runway 33L departures, there could be weight penalties as high as 5,600 pounds which were deemed unacceptable for an airport that serves as the primary international airport for most of the six New England states. *(footnote 3)* Furthermore, the reduced length of construction in Boston Harbor would still not eliminate the most critical resource impacts involving the shallower portion of the harbor bottom that is supporting eel grass growth.

6) Extend the RSA into the harbor to accommodate an EMAS bed capable of 70 knot overrun protection and providing a 600 feet RSA for undershoots: Due to the very high costs with building in the harbor, EMAS is automatically included in all alternatives to reduce the RSA length requirement from 1,000 ft. to the 600 ft. standard. Engineering analysis has shown that there are no significant cost advantages to a filled structure versus a platform on piers. In this case, the latter has significant environmental advantages and cost estimates are based upon this construction. Alternatives with less than 600 feet length were not considered since the marginal costs and environmental impacts were not judged significant enough to offset the compromises in RSA function. Alternative RSA widths were assessed to identify the most practical tradeoff between cost and function to accomplish this need. The results are summarized in Table 3:

Table 3 – RSA Alternatives with EMAS

(Costs shown in 2012 dollars)

	600' x 500'	600' x 400'	600' x 300'
Total Construction Cost including mitigation	$106M	$85.9M	$51.7M
Centerline function	Full 70 knot protection	Full 70 knot protection	Full 70 knot protection
Protected Overshoot Centerline deviance	170' wide EMAS	170' wide EMAS	170' wide EMAS
Protected Undershoot Centerline Deviance	250'	200'	150'
Other issues	165' area either side of EMAS for rescue vehicles and maintenance	115' area either side of EMAS for rescue vehicles and maintenance	65' area either side of EMAS for rescue vehicles and maintenance (adequate)

All of these alternatives exceeded the general FAA cost guidance. However, with 2 million passengers on board jet aircraft operations involving the RSA, it is justified to exceed the $25 million guidance to provide 70 knot overrun protection (B747-400) and 600 foot undershoot protection. This decision was verified through discussions with AAS-1 in Headquarters.

Conclusion

Based on this analysis, we conclude that:

1. The runway corridor should not be moved.
2. The Runway 33L RSA thereby remains fully compliant with the 1,000' by 500' standard.
3. The development of a 600' long by 300' wide RSA for Runway 15R provides near equivalent protection and functionality at half the price and a 40% reduction in the harbor area of impact. The risk of an undershoot occurring outside of the 300 foot width is reduced by centerline guidance of a CAT II ILS and MALSR visual aid. Overshoot protection relies upon the 170' wide EMAS bed. The probability that an overshoot event would be affected by the reduction in width is very remote. Reductions below 300 feet are unacceptable due to the need for a corridor on either side of the EMAS bed for emergency response and maintenance vehicles to safely maneuver and turn around without risk of driving off an over the water platform.

4. The annual volume of passengers on board flights utilizing this runway justifies exceeding FAA guidance on practical cost limits developed for average conditions. In addition this order was published in March of 2004 and would be based upon 2003 dollars.
5. This determination is based upon the cost of the relocating the existing MALSR approach lights into the new RSA. Other enhancements to this runway, including locating the Runway 15R localizer on centerline and upgrading to an ALSF approach light system for Runway 33L, would be considered independent of this determination for meeting basic runway safety area requirements.

Determination

- **Runway 33L departure runway safety area currently meets standards.**
- **It is not practical for Runway 15R departure runway safety area to meet full standards but it can be improved with a 600' by 300' runway safety area with 70 knot EMAS protection for Boeing 747-400, subject to environmental review and approvals.**

Recommended by

_____ Date: _____

Coordination:

_____ Date: _____
Project Manager, Engineering, ANE-620

_____ Date: _____
Lead Certification & Safety Inspector, ANE-620

_____ Date: _____
Branch Manager, ANE-620

_____ Date: _____
Branch Manager, ANE-610

Approved:

_____ Date: _____
LaVerne Reid, Division Manager, ANE-600

Attachment A

National Transportation Safety Board
Washington, DC 20594

Printed on : 12/22/2008 7:52:35 PM

Brief of Accident

Adopted 01/23/1983

DCA82AA013
File No. 2853 | 01/23/1982 | BOSTON, MA | Aircraft Reg No. N113WA | Time (Local): 19:37 EST

			Fatal	Serious	Minor/None
Make/Model:	Mcdonnell Douglas / DC-10-30				
Engine Make/Model:	Ge / CF6-50C2	Crew	0	2	10
Aircraft Damage:	Destroyed	Pass	2	2	166
Number of Engines:	3				
Operating Certificate(s):	Flag Carrier/Domestic				
Name of Carrier:	WORLD AIRWAYS, INC.				
Type of Flight Operation:	Scheduled; Domestic; Passenger Only				
Reg. Flight Conducted Under:	Part 121: Air Carrier				

Last Depart. Point:	NEWARK, NJ	Condition of Light:	Night/Dark
Destination:	BOSTON, MA	Weather Info Src:	Unknown
Airport Proximity:	Off Airport/Airstrip	Basic Weather:	Instrument Conditions
		Lowest Ceiling:	600 Ft. AGL, Overcast
		Visibility:	2.00 SM
		Wind Dir/Speed:	155 / 003 Kts
		Temperature (°C):	Unk/Nr
		Precip/Obscuration:	

Pilot-in-Command	Age: 58	Flight Time (Hours)	
Certificate(s)/Rating(s)		Total All Aircraft:	16091
Airline Transport; Multi-engine Land; Single-engine Land		Last 90 Days:	Unk/Nr
		Total Make/Model:	1992
Instrument Ratings		Total Instrument Time:	Unk/Nr
Airplane			

DRG ARR, PLT ACKD RCPT OF ATIS INFO & FLD COND RPRT, BOTH IN DCG BRAKING ACTION "FAIR TO POOR." HE WAS NOT ADZD OF 3 PLTRPRTS OF BRAKING ACTION "POOR TO NIL" OR "POOR." ACFT WAS CLRD FOR VOR/DME APCH TO RWY 15R. DUE TO PSBL WND SHEAR, 35 DEG OF FLAPS (INSTEAD OF 50) WAS EXTDD DRG APCH. AUTOTHROTTLE/SOD CTL (AT/SC) WAS USED TO CTL SPD (APRX 10 KT HI) DRG APCH. THE HIGHER SPD WAS ACCEPTED IAW CO SOP, BUT THE AT/SC WAS USED THRU-OUT THE FLARE. THE ACFT TCHD DWN APRX 2500' BYD THE DSPLCD THRESHOLD WITH ABOUT 6690' RMNG. (NO LGTD RWY DSTC MKRS AVBL.) ALL DCLRTV DEVICES WERE USED TO SLOW THE ACFT, BUT IT CONTD BYD END OF RWY & WENT OVR A SEA WALL. INV REVEALED PRECIP HAD RFZN TO FROM GLAZE ICE. OF 14 PLTS, 9 HAD NOT VOLUNTEERED BRAKING ACTION RPRTS & TWR DID NOT ASK FOR RPRTS DRG CONTD PRECIP. ATIS NOT UPDATED FOR 2 HRS. FAA REGS LACK GUIDANCE TO ARPT MNGMNT FOR MEASUREMENT OF RWY SLICKNESS, LACKED MEANS OF CORRELATING SLICK RWY SFC WITH ACFT STOP DSTC. DID NOT EXTD AUTH RWY LENGTHS FOR ICY RWYS. ARPT MNGMNT DID NOT INSP/IMPROVE RWY COND AFT BRKG RPRTD POOR/NIL

World Airways Accident Brief NTSB Identification: DCA82AA013
Scheduled 14 CFR Part 121: Air Carrier operation of WORLD AIRWAYS, INC.
Accident occurred Saturday, January 23, 1982 in BOSTON, MA
Probable Cause Approval Date: 1/23/1983

Aircraft: MCDONNELL DOUGLAS DC-10-30, registration: N113WA
Injuries: 2 Fatal, 4 Serious, 24 Minor, 182 Uninjured.

DRG ARR, PLT ACKD RCPT OF ATIS INFO & FLD COND RPRT, BOTH IN DCG BRAKING ACTION "FAIR TO POOR." HE WAS NOT ADZD OF 3 PLTRPRTS OF BRAKING ACTION "POOR TO NIL" OR "POOR." ACFT WAS CLRD FOR VOR/DME APCH TO RWY 15R. DUE TO PSBL WND SHEAR, 35 DEG OF FLAPS (INSTEAD OF 50) WAS EXTDD DRG APCH. AUTOTHROTTLE/SOD CTL (AT/SC) WAS USED TO CTL SPD (APRX 10 KT HI) DRG APCH. THE HIGHER SPD WAS ACCEPTED IAW CO SOP, BUT THE AT/SC WAS USED THRU-OUT THE FLARE. THE ACFT TCHD DWN APRX 2500' BYD THE DSPLCD THRESHOLD WITH ABOUT 6690' RMNG. (NO LGTD RWY DSTC MKRS AVBL.) ALL DCLRTV DEVICES WERE USED TO SLOW THE ACFT, BUT IT CONTD BYD END OF RWY & WENT OVR A SEA WALL. INV REVEALED PRECIP HAD RFZN TO FROM GLAZE ICE. OF 14 PLTS, 9 HAD NOT VOLUNTEERED BRAKING ACTION RPRTS & TWR DID NOT ASK FOR RPRTS DRG CONTD PRECIP. ATIS NOT UPDATED FOR 2 HRS. FAA REGS LACK GUIDANCE TO ARPT MNGMNT FOR MEASUREMENT OF RWY SLICKNESS, LACKED MEANS OF CORRELATING SLICK RWY SFC WITH ACFT STOP DSTC, DID

NOT EXTD AUTH RWY LENGTHS FOR ICY RWYS. ARPT MNGMNT DID NOT INSP/IMPROVE RWY COND AFT BRKG RPRTD POOR/NIL

The National Transportation Safety Board determines the probable cause(s) of this accident as follows:

UNSAFE/HAZARDOUS CONDITION..NOT IDENTIFIED..AIRPORT PERSONNEL
INSUFF STANDARDS/REQUIREMENTS,OPERATION/OPERATOR..FAA(ORGANIZATION)
SAFETY ADVISORY..NOT ISSUED..ATC PERSONNEL(LCL/GND/CLNC)

Contributing Factors

WEATHER CONDITION..TEMPERATURE EXTREMES
TERRAIN CONDITION..SNOW COVERED
WEATHER CONDITION..RAIN
AIRPORT FACILITIES,RUNWAY/LANDING AREA CONDITION..ICY
SAFETY ADVISORY..NOT ISSUED..PILOT OF OTHER AIRCRAFT
MONITORING..INADEQUATE..ATC PERSONNEL(LCL/GND/CLNC)
WEATHER CONDITION..UNFAVORABLE WIND
AIRSPEED..EXCESSIVE..PILOT IN COMMAND
AIRPORT FACILITIES,RUNWAY REMAINING DIST MARKERS..INADEQUATE
TERRAIN CONDITION..DOWNHILL
TERRAIN CONDITION..WATER,ROUGH

LOGAN AIRPORT RSA
Runway Safety Area Improvements Project

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LOGAN AIRPORT RSA
Runway Safety Area Improvements Project

Attachment B
Environmental Notification Form Distribution List

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Attachment B: Environmental Notification Form Distribution List

In accordance with Section 11.16 of the MEPA regulations (301 CMR 11.00), the Massachusetts Port Authority (Massport) is distributing this Environmental Notification Form (ENF) to the following federal, state, and local agencies and interested parties.

It is our understanding that this document will be noticed in the *Environmental Monitor* published on July 8, 2009 commencing the 30-day public review period. Therefore, comments on the ENF are due by August 7, 2009. To request a copy of this document, please contact Stewart Dalzell at (617) 568-3524 or at SDalzell@massport.com.

Table B-1 Distribution

Federal Agencies

Richard Doucette
Manager Environmental Programs
U.S. Department of Transportation
Federal Aviation Administration
New England Region
12 New England Executive Park, Box 510
Burlington, MA 01803

MEPA Reviewer
U.S. Environmental Protection Agency, Region 1
1 Congress Street
Suite 1100 (CMU)
Boston, MA 02114-2023

Tim Timmerman
U.S. Environmental Protection Agency, Region 1
1 Congress Street
Suite 1100 (CMU)
Boston, MA 02114-2023

Matt Schwieisberg
U.S. Environmental Protection Agency, Region 1
1 Congress Street
Suite 1100 (CMU)
Boston, MA 02114-2023

MEPA Reviewer
U.S. Fish and Wildlife Service
New England Field Office
Department of the Interior
70 Commercial Street, Suite 300
Concord, NH 03301-5087

Commander Col. Philip T. Feir
U.S. Army Corps of Engineers
New England District
696 Virginia Road
Concord, MA 01742-2751

MEPA Reviewer
National Marine Fisheries Service
Northeast Regional Office
Office of Protected Species
1 Blackburn Circle
Gloucester, MA 01930

Chris Boelke
NOAA/
National Marine Fisheries Service
One Blackburn Drive
Gloucester, MA 01930-2298

Ted Lento/Corps
U.S. Army Corps of Engineers
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State Agencies

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Rachel Freed
Section Chief, Wetlands and Waterways
Department of Environmental Protection
Northeast Regional Office
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Lisa Rhodes
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Boston, MA 02108

Table B-1 Distribution

State Agencies (Continued)

Geraldine Scoll
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Amy Coman, Endangered Species
Natural Heritage and Endangered Species Program
Massachusetts Division of Fisheries and Wildlife
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Executive Office of Transportation
10 Park Plaza, Suite 3170
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Jessica Kenny
MEPA/NEPA Reviewer
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Massachusetts Highway Department
Attn: MEPA Coordinator
519 Appleton Street
Arlington, MA 02476

Brona Simon
Massachusetts Historical Commission
State Historic Preservation Officer
The MA Archives Building
220 Morrissey Boulevard
Boston, MA 02125

MEPA Coordinator
Massachusetts Water Resource Authority
Charlestown Navy Yard
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Steve McGoldrick, Deputy Director
Metropolitan Area Planning Council
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Executive Office of Environmental Affairs
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Environmental Analyst, MEPA Office
Executive Office of Environmental Affairs
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Department of Conservation and Recreation
251 Causeway Street, Suite 600
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Department of Conservation and Recreation
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Central Artery/Tunnel Project
Massachusetts Turnpike Authority
185 Kneeland Street
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Massachusetts Aeronautics Commission
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Boston, MA 02116

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Massachusetts Office of Coastal Zone Management
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Tay Evans
MA Division of Marine Fisheries
Annisquam River Marine Fisheries Field Station
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Gloucester, MA 01930

Charles Costello
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Phil DiPietro
MDEP
Northeast Regional Office
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Wilmington, Massachusetts 01887

Alison Leschen
New Bedford Offices
Massachusetts Division of Marine Fisheries
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New Bedford, MA 02740

State Government

Senate President Therese Murray
Massachusetts State House, Room 330
Boston, MA 02133

Senator Steven Baddour
Massachusetts State House, Room 513
Boston, MA 02133

Congressman Ed Markey
c/o Patrick Lally
5 High Street, Suite 101
Medford, MA 02155

Table B-1 Distribution

State Government (Continued)

Congressman Mike Capuano
110 First Street
Cambridge, MA 02141

Speaker Rebert A. DeLeo
Massachusetts State House, Room 356
Boston, MA 02133

Representative Kathi-Anne Reinstein
Massachusetts State House, Room 617
Boston, MA 02133

Representative Brian Wallace
Massachusetts State House, Room 472
Boston, MA 02133

Senator John A. Hart
Massachusetts State House, Room 109C
Boston, MA 02133

Representative Joseph C. Wagner
Massachusetts State House, Room 134
Boston, MA 02133

Representative Eugene L. O'Flaherty
Massachusetts State House, Room 481
Boston, MA 02133

Representative Charles Murphy
Massachusetts State House, Room 243
Boston, MA 02133

Representative Byron Rushing
Massachusetts State House, Room 481
Boston, MA 02133

Representative Martha Walz
Massachusetts State House, Room 443
Boston, MA 02133

Senator Anthony Petruccelli
Massachusetts State House, Room 413B
Boston, MA 02133

Representative Carlo Basile
State House
Room 544
Boston, MA 02133

City of Boston

Thomas Menino
Mayor
City of Boston
One City Hall Square
Boston, MA 02201

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Boston Parks and Recreation Dept.
1010 Massachusetts Avenue
Boston, MA 02118

Charlie Jewel
Boston Water and Sewer Commission
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Boston, MA 02119

Nancy Grilke
Environmental Services Cabinet Chief of Staff
City Hall, Room 603
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Boston Water and Sewer Commission
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Boston, MA 02119

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Boston City Council
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Boston, MA 02201

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Boston, MA 02201

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Executive Director
Boston Public Health Commission
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Boston, MA 02118

Maura Zlody
City of Boston Environment Department
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City Hall, Room 603
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Rosario Salerno
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One City Hall Square
Boston, MA 02201

Robert Consalvo
District Councilor, 5
Boston City Council
Boston City Hall
Boston, MA 02201

Bill Linehan
District Councilor, 2
Boston City Council
Boston, City Hall
Boston, MA 02201

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Boston Redevelopment Authority
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Boston Conservation Commission
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Director
Environmental Services Cabinet
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Maureen E. Feeney
Council President
Boston City Council
Boston City Hall
Boston, MA 02201

Table B-1 Distribution

City of Boston (Continued)

John Connolly
Councilor-At-Large
Boston City Council
Boston, City Hall
Boston, MA 02201

Michael Ross
Council President
Boston City Council
Boston, City Hall
Boston, MA 02201

Charles C. Yancey
District Councilor, 4
Boston City Council
Boston, City Hall
Boston, MA 02201

John Tobin
District Councilor, 6
Boston City Council
Boston, City Hall
Boston, MA 02201

Charles Turner
District Councilor, 7
Boston City Council
Boston, City Hall
Boston, MA 02201

Mark Ciommo
District Councilor, 9
Boston City Council
Boston, City Hall
Boston, MA 02201

John Forbes
Mayor's Office
Neighborhood Services
Boston City Hall, Room 205
Boston, MA 02201

Sal LaMattina
District Councilor, 1
Boston City Council
Boston City Hall
Boston, MA 02201

Town of Winthrop

Larry Holmes
Interim Town Manager
Winthrop Town Hall
One Metcalf Square
Winthrop, MA 02152

Richard Dimes
Winthrop Planning Board
Winthrop Town Hall
One Metcalf Square
Winthrop, MA 02152

Jerome Falbo
Town of Winthrop Air Pollution
Noise and Airport Hazards Committee
80 Jefferson Street
Winthrop, MA 02152

Mary Kelley
Chair, Winthrop Conservation Commission
Winthrop Town Hall
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Winthrop, MA 02152

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Council President
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Winthrop, MA 02152

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LOGAN AIRPORT RSA
Runway Safety Area Improvements Project

Table B-1 Distribution

Community Groups and Interested Parties

Bob D'Amico
300 Maverick Street
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Bob Driscoll
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LOGAN AIRPORT RSA
Runway Safety Area Improvements Project

Table B-1 Distribution

Community Groups and Interested Parties (Continued)

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David Arinella
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East Boston, MA 02128

Fran Carbone
174 Bayswater Street
East Boston, MA 02128

John Vitagliano
19 Seymour Street
Winthrop, MA 02152

Libraries

Boston Public Library
Connolly Branch
433 Centre Street
Jamaica Plain, MA 02128

Boston Public Library
Main Branch
666 Boylston Street
Boston, MA 02117

Boston Public Library
Charlestown Branch
179 Main Street
Charlestown, MA 02129

Boston Public Library
South Boston Branch
646 East Broadway
South Boston, MA 02127

Boston Public Library
East Boston Branch
276 Meriden Street
East Boston, MA 02128

Boston Public Library
Orient Heights Branch
18 Barnes Avenue
East Boston, MA 02128

Winthrop Public Library
One Metcalf Square
Winthrop, MA 02151

State Transportation Library
10 Park Plaza
Boston, MA 02116-3973

Chelsea Public Library
569 Broadway
Chelsea, MA 02150